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Optimal Regulatory Design in Banking in Transition Economies

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Introduction

The chapters in this dissertation are all related to the optimal regulatory design of banks in transition economies. The contributions in this dissertation are mainly empirical, but also contain some significant theoretical insights. The countries under investigation are Russia (Part I) and Central and Eastern Europe (Part II).

In a first chapter we address questions related to the optimal design of a central bank. In this chapter we consider the special case of Russia. The Central Bank of Russia (CBR) assumes a wide range of functions not traditional to a central bank. In addition to the daily conduct of monetary policy, it acts as a regulator and supervisor of the banking sector, is responsible for the implementation of a deposit insurance scheme and is the main owner of Russia's largest commercial bank, Sberbank. We empirically evaluate the current financial supervisory authority arrangement within the central bank, investigating whether the CBR uses its supervisory information to complement monetary policy. We find indications that the CBR uses its hands-on supervisory information to maintain financial stability and to accommodate state-owned banks' balances.

In a second chapter, we empirically study the bank licensing policy of the CBR. We focus on the conflict between two central bank objectives - individual bank stability and systemic stability - and the regulatory forbearance that follows from it. Although we find enforcement of some prudential regulations, our results suggest forbearance for a majority of other regulations. The type of banks that are protected from license withdrawal suggests a tacit concern for systemic stability. Specifically, banks in highly concentrated bank markets, large banks, and banks that are active on the interbank market enjoy protection from license withdrawal. The CBR is also reluctant to withdraw licenses when there are 'too many banks to fail' and from large deposit banks as this conflicts with the CBR objective to secure depositor confidence and systemic stability.

A third chapter assesses how the interplay between a system of repressive reserve requirements and capital requirements can impact bank risk behavior. We

first model the interaction and effects on risk-taking theoretically and provide an empirical illustration for the assertions made in the theoretical model for the Russian banking sector. The theoretical model indicates that the reduction of financial repression may increase risk behavior, while the introduction or enforcement of a capital requirement can be useful in reducing gambling behavior. When introducing capital requirements into a financially repressed economy, risk taking will be reduced, as long as banks behave sufficiently myopic. However, in an environment characterized by a high cost of capital and a high default probability of loans, the introduction of a risk-based capital requirement may not succeed in reducing gambling. This suggests that as long as capital is costly, financial repression can be more successful in reducing risk compared to a capital requirement. Before introducing a capital requirement, measures aimed at lowering the cost of capital should be a primary focus. Only when capital requirements can successfully reduce bank risk behavior, can financial repression harmlessly be diminished. Data for the Russian banking sector indicate that this was not yet the case by the end of 2003.

A fourth and fifth chapter shift attention away from Russia and prudential regulation towards the economies of Central and Eastern Europe and bank market structure. In chapter four, we investigate the determinants of bank interest margins in Central and Eastern Europe. We assess to what extent the relatively high bank margins in Central and Eastern Europe can be attributed to low efficiency and non-competitive market conditions, or to regulatory reforms. We systematically compare Central and Eastern European banks with Western European banks. Our results indicate that banking in Central and Eastern Europe is on a virtuous path; increased efficiency benefits customers, while capital adequacy ensures systemic stability.

In a fifth and last chapter, we study the effect of different entry modes on the interest rate for loans in a model where domestic banks possess private information about their incumbent clients but foreign banks have better screening skills. Theory predicts that foreign-acquired banks charge higher lending rates for new customers than foreign *de novo* banks. Our empirical evidence shows that in 10 Central and Eastern European countries, the average lending rate of foreign-acquired banks may initially however be lower. One reason for this is that a bank that has a majority of existing firm-bank relationships in its portfolio, has less asymmetric information on borrowers than when it has to screen all new credit applicants. On average, it can therefore charge lower lending rates. We further find that competition is stronger if market entry occurs through a greenfield investment and therefore domestic banks' interest rates are lower. Thus, the mode of entry does not only impact firms' access to credit but also lending conditions. Consequently, governments play an important

role in deciding how to let foreign banks enter their markets.

Part I

Russia

Chapter 1

In search of monetary policy.[1]

1.1 Introduction

When discussing the optimal conduct of monetary policy, many authors take the view that central banks' objectives should consist exclusively of keeping inflation low, ensuring stable economic growth and maintaining financial stability – with emphasis on the first two, particularly inflation fighting. As a result, much of the literature on monetary policy discusses ways to achieve low inflation through improvements in institutional design and promotion of central bank independence.[2] In reality, many central banks do not consistently adhere to the policy guidelines set out by e.g. Mishkin (2000a) in their daily conduct of monetary policy, mainly because they assume a grab bag of regulatory functions not generally seen as central to monetary policy, which moreover may conflict with monetary policy objectives. The Central Bank of Russia (CBR) is a prime example of a central bank that governs a wide range of often-conflicting functions. Besides the daily conduct of monetary policy, the CBR acts as a regulator and supervisor of the banking sector, assumes single licensing and closure authority over banks and acts as a lender of last resort (LLR) for imperilled banks. The CBR is also presently implementing a deposit insurance scheme (DI), and is the country's single largest creditor and main owner of Sberbank, Russia's largest bank. Thus, the multi-tasked CBR faces abundant opportunities for conflicts of interest as it engages in its various functions.

This chapter explores how the CBR's "in-house" bank supervision function may impact the central bank's other functions and objectives. It provides an empirical

[1] An adapted version of this chapter appeared as: Claeys, Sophie (2005), "Optimal Regulatory Design for the Central Bank of Russia," BOFIT Discussion Paper 7/2005.

[2] For a discussion on the need for central bank independence in achieving inflation targets, see Cukierman (1994) and references therein.

evaluation of the current financial supervisory authority (FSA) arrangement within the central bank, investigating whether the CBR uses its "hands-on" supervisory information to complement monetary policy. Supervisory information can be particularly useful to a central bank in times of bank distress, since monetary policy can be used to accommodate bank balances and avoid financial turmoil. To the extent that this does not undermine the financial supervisory authority, supervisory information then complements monetary policy. Using a simple Taylor rule framework, we find indications that the CBR uses its hands-on supervisory information to maintain financial stability and to accommodate state-owned banks' balances.

The chapter is organized as follows. We begin section 2 with a brief review of the literature on the optimal allocation of regulatory powers within a central bank and apply select insights to an appraisal of potential alterations to the CBR's regulatory design. The discussion in section 3 then turns to the CBR's role of regulator and supervisor of the banking sector. We empirically investigate the usefulness of supervisory information for the conduct of monetary policy and analyze whether the current design of supervision contributes to our understanding of the central bank's monetary policy behavior through monetary policy rules. Section 4 concludes.

1.2 A review of the literature on regulatory design and lessons for the CBR

The CBR presently assumes a wide range of functions. Because of the inconsistencies they potentially generate, this has implications on how smoothly the central bank operates. The literature suggests that the current regulatory design impairs the CBR's ability to adequately achieve all its objectives. This section briefly surveys the literature on optimal design of banking regulation and relates it to the current functions taken on by the CBR.

Introduction

Until the end of the 19th century, central banks did not generally assume an explicit role of lender of last resort nor shoulder supervisory and regulatory tasks. The subsequent changes in banking (and financial markets more generally), however, necessitated a lender-of-last-resort (LLR) function.[3] Central banks now often act

[3] See e.g. Goodhart and Schoenmaker (1995) and Goodhart (2000) on how the changing nature of the financial system has affected the functions and objectives of central banks. Capie et al. (1994) describe how central bank functions have evolved over time.

as LLRs for otherwise economically sound banks with liquidity problems.[4] The specific nature of commercial banking, where banks are mainly involved in granting long-term (illiquid) loans and receiving short-term (liquid) deposits from the public, makes the banking sector particularly vulnerable to shocks. The main risks that arise from transforming deposits into long-term credit portfolios are interest-rate risk (due to the maturity mismatch) and liquidity risk (due to the possibility of unexpected withdrawals by depositors). In the event of multiple withdrawals by depositors, a bank will be unable to fully service all depositors at the same time. When a bank is hit by such a liquidity shock and is unable to extract funds via the interbank market, the bank may turn to the LLR to meet the liquidity demands of its depositors.

Diamond and Dybvig (1983) show that banks can be protected from bank runs through the government provision of depositor insurance (DI). While DI may solve the coordination failure between a large group of small depositors (and thus lower systemic risk), it can also increase the moral hazard present on the banks' side by removing the incentive for depositors to monitor their banks. Moreover, the bank's own profitability concerns create moral hazard problems in choosing its asset portfolio. In the presence of DI, risk-taking behavior on behalf of the bank can be heightened by limiting the liability the bank faces in the event of default. Such increased risk-taking increases the probability of bank failures.

In general, bank stability is affected by vulnerability to individual runs and systemic risk on the liability side and bank risk-taking behavior on the asset side. Most safety and soundness regulatory instruments in the banking industry aim at reducing the perverse incentives banks face when composing their asset portfolios through banking regulation and prudential supervision.[5]

Supervision and systemic stability

Countries may use a number of arrangements for the allocation of bank supervision.[6] If a central bank is concerned with systemic stability and acts as a LLR, one

[4] Bagehot (1873) put forward the rules for extending LLR funds for the Bank of England to "distinctly acknowledge that it is its duty to support the market in times of panic" by lending to "illiquid but solvent banks" but at "penalty rates."

[5] Much of the focus of prudential regulation has been on bank solvency via capital adequacy requirements. These requirements are intended to reduce the gambling behavior of banks by putting bank equity at risk (see e.g. BIS Core Principles for effective banking supervision (1997) and Dewatripont and Tirole (1994) for a more general discussion). See also Mishkin (2000b) and Summer (2002) on the need for prudential supervision and banking regulation.

[6] For example, the US Federal Reserve assumes supervisory functions, but shares them with other supervisory agencies. In the Netherlands, supervision has always been a central bank function. In Finland and the UK, the financial supervisory authorities are separate from the central bank, but

can argue that supervision should be in the hands of the central bank to facilitate its LLR functions. Since only those banks whose solvency is at doubt typically come to the central bank for help, as LLR, the central bank will only be inclined to lend when the bank's failure poses a threat to financial system stability - a judgement that can be facilitated on the basis of "in-house" supervisory information. When there is a well-functioning interbank market, however, solvent banks can get loans elsewhere when they need extra liquidity. Private supervisory information may then be useful in gauging a bank's solvency.

When a central bank's primary concern is maintaining financial stability, it may be reluctant to close down a large bank and resort to regulatory forbearance.[7] On the other hand, if banks assume forbearance will be forthcoming, they may increase their risk-taking behavior and produce precisely the outcome the central bank hoped to avoid. Already we can see that combining LLR and supervisory functions may be incongruent within the central bank's objective function.

Moreover, focusing on reducing moral hazard runs the danger of distracting the financial supervisory authority from assessing how its actions impact the economy. A unified regulator must be willing to grapple with the conflict between strict enforcement and maintaining systemic stability.

These conflicts are real and cannot simply be avoided through institutional design. Claeys et al. (2005a) empirically investigate the degree of bank supervisory forbearance for the Russian banking market. The evidence suggests that prudential regulations in Russia are not effectively enforced because they conflict with other objectives inherent to the CBR's objective function. To the extent that regulatory forbearance impacts the risk-taking behavior of banks, these results provide some empirical support for separating bank supervision and LLR functions. Nonetheless, a single authority may be preferable when conflicts intensify, because it can adhere to its internal hierarchy of LLR and supervisory functions and let the hierarchy depend on the situation at hand to reach an efficient outcome.[8]

Supervision, deposit insurance and lender of last resort

Much of the theoretical literature focuses on specific aspects of banking supervi-

work in close cooperation. In Russia, supervision and prudential regulation are housed within the CBR.

[7] For example, because of reputational issues or because the central bank wants to maintain a well-functioning payments system when the large bank is an important player in the interbank market.

[8] See Wall and Eisenbeis (1999) for a general discussion on how regulatory structure impacts priority choices among conflicting public policy goals. Eisenbeis (2004) discusses agency problems and goal conflicts in designing a financial regulatory structure with a special focus on the EMU.

sion. One strand of the literature analyses the usefulness of capital adequacy rules as part of prudential regulation in reducing moral hazard problems in banking.[9] Some authors focus on how deposit insurance schemes (DI) may affect moral hazard and how DI should be optimally designed.[10] A small group of papers address the question of how different regulatory functions should be optimally coordinated to avoid inconsistent policy.

A relatively new strand of investigation deals with the "LLR-DI-FSA nexus," i.e. analyzing the optimal allocation of the lender-of-last resort, deposit insurance and supervisory functions.[11] Using an incomplete contracts setting, Repullo (2000) considers who should act as LLR: the central bank or a deposit insurance agency (DIA)? His results indicate that the LLR function should be allocated contingent upon the size of the liquidity shock banks are facing. He further assumes that supervisory information can be shared and that the agency in charge of LLR collects it. This information is assumed to contain qualitative information that enables the supervisor to generate an assessment of the bank's assets, although this information is not verifiable. As a result, a solvent bank can be denied a loan and an insolvent bank can get a loan. This is important because of the imparity between the agencies' objective functions and the social welfare function. A central bank is assumed to care about the impact of a bank failure on systemic stability, while a deposit insurer is assumed to care about the impact of a bank failure on reimbursement of insured depositors. The main results suggest a role for both the central bank and the DIA as LLR; the central bank for small liquidity shocks, the DIA for large liquidity shocks.

When applying this setting to the CBR, one can assume that part of the supervisory information available to the central bank cannot be observed by outsiders. Further, the CBR's main objective is somewhat clouded as it also happens to be the main owner of Russia's largest commercial bank. In addition to the expected pay-off from the loan of last resort, systemic and individual bank stability, as well as the repayment of insured depositors enter the equation.

Repullo (2000) suggests a way to determine who should be responsible for bank supervision. When small liquidity shocks are more frequent than large ones, his model suggests that the central bank should be in charge of supervision. This ar-

[9] See e.g. the Journal of Banking and Finance,Volume 19, Issues 3-4, pp. 393-741 (June 1995) on "The Role of Capital in Financial Institutions."

[10] See e.g. Prescott (2002), Cordella and Yeyati (2002) and Morrison and White (2004). Demirgüç-Kunt and Kane (2001) empirically review deposit insurance design across countries. Demirgüç-Kunt and Detragiache (2002) empirically analyse the impact of deposit insurance on banking system stability.

[11] Others analyze the issue of how regulation should be optimally designed more generally. Mayes (2005) presents an enlightening discussion of the issues at hand.

gument, however, is limited to the consideration that when the costs of transferring information are high, the agency that uses the information most should be in charge of supervision. It ignores the impact of possible conflicts of interest on risk-taking behavior of banks, as well as the costs of increased risk-taking created by a) the presence of a LLR, or b) low enforcement of prudential regulation, in the objective functions of the different agencies. The propensity for risk-taking could be incorporated into the analysis by assuming that a supervised bank has opportunities to divert funds to more risky projects and that the probability that the bank will gamble depends on which body assumes the LLR and supervisory functions. In constructing the payoffs for deciding whether a loan of last resort should be granted, one would then also take into account how the design of the regulatory scheme affects a bank's risk-taking choices.

In a subsequent paper, Repullo (2005) takes up the issue of the extent to which the presence of a LLR enhances bank risk-taking. He finds that the presence of a LLR in itself does not necessarily imply greater risk-taking, but rather that a bank's appetite for risk-taking is stepped up when penalty rates are charged. Again, the paper says little about supervision as such. There is only a consistently enforced capital rule. Unsurprisingly, the fact that the Russian banking market is subject to prudential rules carries little weight in bank portfolio decisions when banks do not expect that the rules will be enforced. In other words, an increase in enforcement is one straightforward way to get banks to incorporate supervision into their decision making and diminish their propensity for risk-taking.

Kahn and Santos (2005) parallel the argument in Repullo (2000) and use the assumption that banks have the discretion to divert funds to more risky investments. In a setting with a unified regulator, the authors find a) excessive regulatory forbearance, b) insufficient monitoring and c) sub-optimal investment in loans. One crucial assumption is that the single regulator lacks the arbitrary authority to close a bank. A bank is only closed when the regulator decides not to lend to the bank when it faces a liquidity shortfall. When the regulator has full authority to close banks (on top of the power to extract rents from the bank under all circumstances), the bank loses all incentives to invest in illiquid assets. The authors argue that regulatory forbearance can be reduced by setting specified loan rates for the LLR and giving the DIA authority to shut down banks. Alternatively, they suggest both the central bank and the DIA could act as a LLR (see Repullo, 2000). The first solution does not clarify to what extent banks will be tempted to take on more risk, nor what happens with the degree of bank monitoring by the supervisory agency.

The results in Kahn and Santos (2005) offer some insights into the implications

of the CBR's arrangements. They argue that when the central bank assumes all responsibilities, including the authority to close banks (as the CBR), there will be excessive regulatory forbearance, insufficient monitoring and a sub-optimal level of lending. This is a valid appraisal of the current situation in Russia. Lending figures remain low by international standards[12] and empirical evidence suggests low levels of monitoring and enforcement of regulations (Claeys et al., 2005a). The emphasis, therefore, needs to go to regulatory enforcement. In fact, if the regulator fails to credibly commit to closing banks, risk-taking behavior increases regardless of which agency assumes authority.[13] Indeed, when banks can count on the regulatory forbearance of the central bank, they are prone to assume risk and expect to be bailed out when they get into trouble. This is costly in terms of failure of loans or investments, which inevitably entails a loss of funds that could have been allocated more efficiently.

Supervision and monetary policy

The potential conflict between monetary policy and supervision arises when supervisory information impacts monetary policy so that decisions defy (or follow) what is commanded by economic conditions and favor (or disfavor) bank balances. Such a conflict becomes apparent, e.g. when monetary policy needs to be tightened, but bank balances are weak. However, the financial condition of bank balances will mostly deteriorate during times of economic distress. While an independent FSA will then put extra pressure on banks to improve their solvency (procyclical behavior), the central bank will ease monetary policy by injecting funds into the economy (countercyclical behavior) (Ioannidou, 2005). A unified regulator may therefore behave differently to bank stress due to these conflicts.

On the other hand, when the central bank has an external monetary objective such as an exchange rate target, its policy may harm individual bank stability (Goodhart, 2000). This is clearly the case when monetary policy is used to hold depreciation pressure at bay by increasing interest rates. Indeed, this characterizes much of the CBR's policy in the post-1998 crisis period, when ruble depreciation against the USD forced the CBR to keep interest rates high. More recently, high oil prices and a declining USD led to ruble appreciation, and motivated the Russian

[12] See e.g. the data on loans in Tompson (2004) and Chowdhury (2003).

[13] In general, these papers do not consider the conflicts of interest arising from assuming all three functions of a supervisory authority (LLR, deposit insurer and closure authority). To look at the conflict-of-interest problem, one needs to define which aspect of policy holds top priority for the central bank – something that is not always immediately apparent. Only when the relative importance of different functions is defined can one interpret or build an appropriate utility function. Obviously, priorities can also shift over time.

government in April 2004 to impose a limit on the appreciation of the real effective exchange rate. With an appreciating currency, interest rates can be lowered, even if internal inflationary pressures suggest a higher rate is necessary. Such a stance helps banks without endangering their individual stability.

If monetary policy transmission is assumed to work through the bank channel, the conflicts that arise will be more acute. Particularly in the case where bank loan portfolios are characterized by a massive maturity mismatch, so that any increase in interest rates negatively impacts bank profitability. On the other hand, when banks are mainly financed with retail deposits, conflicts are less likely since these interest rates are unlikely to follow large short-term swings in the money market. The potential conflict between supervision and monetary policy therefore depends on the structure of the banking system. Russian bank portfolios are characterized by their short-term nature in both assets and liabilities (see e.g. Chowdhury, 2003). Although the term structure of loans to the private sector is gradually lengthening, short-term loans must often be rolled over because of the lack of long-term funding.[14] Despite the low level of long-term loans, the inability of Russian banks to attract long-term liabilities generates a maturity mismatch that makes the sector vulnerable to interest rate changes.

Next to the conflicting objectives of exchange rate stability and low inflation, the combination of supervisory powers and monetary policy may change expectations with respect to the stance of monetary policy, which in turn impacts how banks behave. Combining the tasks of supervision and monetary policy may of course have its advantages and can be used to maintain financial stability. CBR concerns about financial stability may explain why it has resorted to regulatory forbearance in its supervisory function. When banking market stability becomes a target on its own, this should be visible in the CBR's conduct of monetary policy. We empirically investigate this notion in section 3.

Lessons for the CBR

The theoretical literature on regulatory structure has to be interpreted carefully in the developing market cases such as Russia. The quality of published information is often quite poor and the legal system may be too weak to coordinate the various functions of the central bank and the supervisor. When accounting rules are inadequate and give rise to window-dressing and creative accounting, regulations may turn out to be meaningless and supervision void altogether, no matter where it is

[14] This is because all deposits, regardless of their maturity, are demand deposits by law. The CBR is looking into a law that would make term deposits possible (Tompson, 2004).

done. In such a situation, one needs to assess how supervision can be rendered effective before addressing the optimal allocation of regulatory powers. Given the low enforcement of prudential regulation in Russia, one can arguably defend keeping a FSA in-house the CBR. However, when supervisory information adequately reflects banking sector health, a central bank can use this information to carry out its monetary policy decisions and to optimally balance its act as a LLR. The supervisory authority can therefore be delegated to an outside office which is less prone to political pressure nor suffers from an inherent inconsistency in its objective function, while allowing the central bank access to this information. This should improve difficulties in enforcement and allow a central bank to preserve financial stability. In a fragile banking system, this may be one of the central bank's primary concerns. In Russia, however, it might turn out that the CBR is more concerned with the stability of state-owned banks.

Empirical assessment of inconsistencies

To date, empirical assessments of the possible costs of improperly designing a central bank's powers or functions are fairly limited. The main questions that need to be addressed are:

1. Does the current design lead to regulatory forbearance?
2. Does regulatory forbearance lead to increased risk-taking by banks?
3. What are the benefits of "in-house" supervisory information for LLR functions?
4. How does "in-house" supervisory information benefit monetary policy?

Claeys et al. (2005a) empirically investigate how well the CBR enforced its prudential regulations and provide evidence of a significant degree of regulatory forbearance (see chapter 2). Claeys et al. (2005b) investigate theoretically and empirically how the interplay between a repressive form of monetary policy and supervision can negatively impact risk behavior of Russian banks (see chapter 3). Goodhart and Schoenmaker (1995) analyze whether supervision should be separated from monetary policy through the investigation of bank failures under different regimes. Their empirical evidence suggests that a system of combined arrangement experiences significant fewer failures compared to a separate arrangement (although the question remains as whether such a system is more efficient). Di Noia and Di Giorgio (1999) find that inflation rates are higher and more volatile in countries where supervisory functions are housed entirely inside the central bank. Ioannidou (2005) finds that

the monetary policy responsibilities of the Federal Reserve alter its bank supervisory behavior. Specifically, the Federal Reserve tends to be less strict in supervision when monetary policy is strenghtened. Peek et al. (1999) investigate the role of supervision in central banking for the United States. Their results indicate that while inflation and unemployment forecasts can be improved using supervisory information, the latter does not affect the Federal Reserve's monetary policy through staff forecasts. Supervisory information does, however, significantly influence the monetary decisions made through voting behavior by members of the Federal Open Market Committee. This chapter follows a similar approach and addresses the question of whether supervisory information significantly influences the conduct of monetary policy in Russia. Since the CBR does not report any inflation or unemployment forecasts nor publishes any decision discussions or votes of members of its monetary board, we only investigate whether supervisory information contributes to the understanding of observed monetary policy behavior in Russia.

1.3 Is supervision central to the Central Bank of Russia?

This section provides a preliminary and necessarily limited empirical answer to the question of whether prudential supervision is useful for the conduct of monetary policy in the Russian Federation. Does "hands-on" supervisory information guide monetary policy decisions of the Russian central bank? Does supervisory information add significantly to our understanding of central bank behavior by improving the performance of benchmark rules based on this wider information set?

A simple Taylor rule can often be used as a benchmark to assess the monetary policy decisions made by the central bank.[15] In the first step, we analyze whether the policy of the CBR can be described adequately using modified versions of the original Taylor rule. In the second step, we investigate whether banking system stability is an explicit target of monetary policy by including supervisory information in the benchmark policy rule. For this purpose, we assume that the central bank observes current and past inflation, interest rates, actual and potential output and the exchange rate. We assess how this information affects the forward-looking behavior of the central bank.[16] The CBR additionally has access to supervisory information,

[15] This has been extensively documented for the US and later Germany and the Euro Area. See e.g. Clarida and Gertler (1996), Clarida, Galí and Gertler (1998), Rudebusch and Svensson (1998) and Peersman and Smets (1999).

[16] Assuming forward-looking behavior on the part of the CBR may be overdoing it for some parts

available to the public only with a lag.

1.3.1 A Taylor rule tailored to the CBR

Methodology

Given that the CBR has an explicit exchange rate stability objective, we apply an open economy version of the Taylor rule.[17] Based on Taylor's original rule (1993) and interest rate smoothing, we assume that the following equation describes central bank behavior in the Russian Federation:

$$i_t = (1-\lambda)\cdot i_t^0 + \lambda \cdot i_{t-1} + \nu_t, \tag{1.1}$$

$$i_t^0 = i^* + \gamma_1 \cdot [E_t\{\pi_{t+n}\} - \pi^*] + \gamma_2 \cdot [E_t\{y_t - y_t^*\}] + \gamma_3 \cdot e_t, \tag{1.2}$$

in which i_t is the central bank's instrument rate and i^* is the long-term nominal equilibrium interest rate, consistent with the inflation target π^*. $E_t\{\pi_{t+n}\}$ is the expected annual inflation rate for the period between t and $t+n$, conditional upon the information set available at time t, y_t (y_t^*) is the log of monthly (potential) GDP[18] and e_t is the log of the monthly real effective exchange rate.[19] Following Clarida and Gertler (1996) and Clarida, Galí and Gertler (1998), i_t^0 is the central bank's target rate which reacts to changes in expected inflation,[20] the output gap and the effective exchange rate. ν_t can be interpreted as a shock parameter which prevents the CBR from setting the rate according to the rule or as a deliberate policy shock by the CBR which wants to deviate from the rule. According to equation (1.1), we assume that each month the central bank sets the interest rate as a convex combination of the target rate and the lagged interest rate to capture how the actual rate partially adjusts towards the target.

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of the estimation sample. We characterize monetary policy as if the CBR was forward-looking in its policies throughout the entire sample period.

[17] In 2003, the real exchange rate became one of the main targets of monetary policy. Since then, the CBR has set upper limits for real effective exchange rate appreciation and announced it will offset any real appreciation of the ruble (CBR Annual Reports).

[18] We obtain a monthly series of the real GDP index by extrapolating the quarterly index of real GDP (Goskomstat) and using monthly observations of industrial production (Goskomstat) and unemployment (Rosstat) as indicators. We apply an adapted version of the procedure developed in Chow and Lin (1971) to obtain the extrapolated series.

[19] We use the real effective exchange rate, but investigate the impact of changes in the nominal effective exchange rate as well.

[20] This is a generalization of the original rule first proposed by Taylor (1993), whereby the central bank responds to lagged inflation rather than to expected inflation. Clarida et al. (1998) argue that an advantage of this specification is that it implicitly reflects the reality of policymaking, namely that a central bank takes into account the broadest set of information available.

For estimation purposes, equation (1.1) is rewritten as follows:

$$i_t = (1-\lambda)\cdot[\gamma_0 + \gamma_1 \cdot \pi_{t+n} + \gamma_2 \cdot (y_t - y_t^*) + \gamma_3 \cdot e_t] + \lambda \cdot i_{t-1} + \mu_t, \qquad (1.3)$$

in which $\mu_t = -(1-\lambda)\left[\gamma_1\left(\pi_{t+n} - E_t\left\{\pi_{t+n}\right\}\right) + \gamma_2\left(y_t - y_t^* - E_t\left\{y_t - y_t^*\right\}\right)\right] + \nu_t$, $\gamma_0 = i^* - \gamma_1 \cdot \pi^*$. Given that μ_t is a linear combination of forecast errors, it is orthogonal to all variables known by the CBR at time t when setting the interest rate. Further assume that iv_t is a vector of variables within the central bank's information set such that $E_t\left[\mu_t | iv_t\right] = 0$ holds.

Monetary policy in Russia

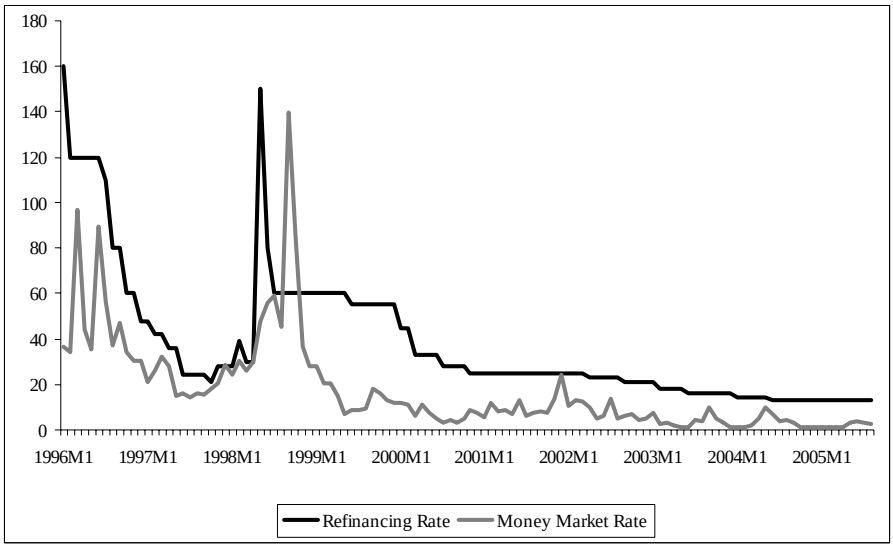
We use monthly data for the period (1996:01–2005:08). We assume that the CBR's monetary policy stance is reflected in movements of the money market rate. Figure 1.1 graphs the CBR's refinancing rate together with movements in the money market rate. The money market rate almost always falls below the refinancing rate set by the CBR (with the exception of 1997:12 and 1998:9–1998:10). After the 1998 crisis, the gap is gradually reduced. The money market rate may not perfectly reflect monetary policy as intended by the CBR but we consider it the best reflection of the monetary policy stance.[21]

We follow a number of natural steps to derive our baseline specification. We use the annual monthly inflation rate for consumer prices as the CBR's inflation target (adapted from Goskomstat) and assume that the CBR is concerned with the one-year ahead inflation rate, $n = 12$, rather than the month-to-month variation in inflation.[22] We include several measures for the output gap. First, we use a Hodrick-Prescott smoothing filter to detrend GDP in order to obtain an estimate of potential GDP, y_t^*. Second, we regress monthly GDP on a linear trend to obtain an estimate of the long-term trend component y_t^*. Third, we obtain a measure for the output gap by detrending monthly GDP using a quadratic trend (following Clarida et al., 1998). Table 1.1 shows the estimation results for (1.3) when using the log difference of the real effective exchange rate as the CBR's external monetary policy target. The first three lines show the estimation results when using an extrapolated monthly GDP series to construct the output gap. Because we use an extrapolated GDP series to subsequently estimate the output gap, our coefficient estimates for γ_2

[21] Others have estimated monetary policy rules for the CBR for several subperiods assuming alternative instruments. See e.g. Esanov et al. (2005).

[22] We use data up to 2005:08 for this purpose. The CBR started reporting target rates for inflation from 1997, when the shift to a form of inflation targeting officially started (see CBR annual reports).

Figure 1.1: Refinancing rate and money market rate, percentage (1996:1–2005:8). Source: IMF International Financial Statistics.



may be biased. In the last three lines of Table 1.1, we therefore show the estimation results when monthly observations of industrial production are used to construct an approximation of the output gap.

Because of a possible endogeneity bias,[23] we use a (non-linear) GMM estimation procedure to estimate the coefficients. Although this estimation method is standard procedure for estimating Taylor rules and establishing causal relations in monetary policy (see Clarida and Gertler (1996) and Clarida et al. (1998), Peersman and Smets (1999)), it has not received the appropriate attention by Esanov et al. (2005) or others authors referenced in that study that estimate Taylor rules for Russia. The non-linear estimator also allows for a correct interpretation of the CBR's smoothing behavior with respect to lagged interest rates and the elasticities of the target rate with respect to the different targets.

[23] The CBR may react to changes in inflation and output by adjusting the interest rate, which may in turn impact how these variables behave.

Table 1.1: CBR reaction functions: Forward-looking Taylor rules using different measures for the output gap.

	λ	γ_0	γ_1	γ_2	γ_3
GDP					
Hodrick-Prescott (14400)	**0.43**	0.41	**0.53**	**-0.58**	**-0.84**
	0.01	*0.40*	*0.02*	*0.09*	*0.06*
Linear Trend	**0.41**	0.50	**0.50**	**-0.58**	**-0.92**
	0.01	*0.25*	*0.02*	*0.03*	*0.03*
Quadratic Trend	**0.44**	0.45	**0.54**	**-0.25**	**-0.91**
	0.01	*0.38*	*0.02*	*0.05*	*0.07*
Industrial Production					
Hodrick-Prescott (14400)	**0.43**	0.52	**0.53**	**-0.47**	**-0.90**
	0.01	*0.38*	*0.02*	*0.07*	*0.06*
Linear Trend	**0.42**	0.66	**0.51**	**-0.40**	**-0.98**
	0.01	*0.37*	*0.02*	*0.04*	*0.05*
Quadratic Trend	**0.43**	**1.17**	**0.51**	**-0.37**	**-0.90**
	0.01	*0.38*	*0.02*	*0.04*	*0.05*

Estimated equation:

$$i_t = (1-\lambda)\cdot[\gamma_0 + \gamma_1 \cdot \pi_{t+n} + \gamma_2 \cdot (y_t - y_t^*) + \gamma_3 \cdot \Delta e_t] + \lambda \cdot i_{t-1} + \mu_t$$

Note: The dependent variable is the monthly average of the daily money market rate (IFS). We obtained a monthly series for GDP by extrapolating the quarterly index of real GDP (Goskomstat), using monthly observations of industrial production (Goskomstat) and unemployment (Rosstat) as indicators, following the procedure developed in Chow and Lin (1971). The estimates are obtained by GMM estimation. The optimal weighting matrix was obtained from first step two-stage least squares parameter estimates. For each element z in the instrument set iv_t we include lags: $z_{t-1}, ..., z_{t-12}$. The instrument set iv_t includes lagged values of inflation, output gap, exchange rate, federal funds rate and money market rate. Using a J-statistic, we can never reject the null hypothesis that the overidentifying restrictions are satisfied. All equations include a dummy variable that accounts for the August 1998 crisis. The sample period is 1996:01 - 2005:8. The number of observations in the estimation sample is 81. Standard errors are reported in italics. Bold numbers indicate significance at the 1 percent level.

The results in Table 1.1 are based on monthly data (1996:01–2005:08).[24] The coefficients for the output gap are always found to be negative and significant, what would indicate that the CBR displays pro-cyclical interest rate behavior. These

[24] Both inflation and interest rates are I(0). DF tests of the null of I(1) or non-stationarity are always rejected.

results are corroborated when using different estimates for the output gap, either based on GDP or industrial production. Because the CBR has started to publish target rates for GDP growth in 1997, this seems very unlikely. The CBR may however be more concerned with deviations of real GDP growth from the potential growth rate. Therefore, in stead of including the output gap as a monetary policy target, we include the deviation of annual real GDP growth from the annual growth rate of potential GDP as a target in our regressions, $\Delta_{12} y_t - \Delta_{12} y_t^*$. Table 1.2 shows the results, again for different estimates of the output gap based on either GDP or industrial production. The coefficient estimates for γ_2 are now always positive, at least for output gap growth using monthly GDP data. The CBR will increase the target interest rate by 7 to 14 basispoints following a 1 percent increase in real GDP output gap growth. The results can only be corroborated for the growth in the output gap when industrial production is detrended using a quadratic trend. In what follows, we retain the specification for estimating γ_2 that uses a quadratic trend to detrend monthly GDP.

Table 1.2: CBR reaction functions: Forward-looking Taylor rules using different measures for output gap growth.

	λ	γ_0	γ_1	γ_2	γ_3
GDP					
Hodrick-Prescott	**0.47**	0.12	**0.55**	**0.13**	**-1.05**
	0.01	*0.28*	*0.02*	*0.02*	*0.09*
Linear Trend	**0.46**	0.02	**0.55**	**0.07**	**-1.05**
	0.01	*0.30*	*0.02*	*0.02*	*0.08*
Quadratic Trend	**0.47**	0.07	**0.55**	**0.14**	**-1.08**
	0.01	*0.28*	*0.02*	*0.03*	*0.09*
Industrial Production					
Hodrick-Prescott	**0.45**	0.49	**0.53**	**-0.05**	**-1.09**
	0.01	*0.32*	*0.02*	*0.02*	*0.05*
Linear Trend	**0.46**	0.54	**0.53**	-0.03	**-1.09**
	0.01	*0.33*	*0.02*	*0.02*	*0.06*
Quadratic Trend	**0.46**	0.30	**0.54**	**0.03**	**-1.11**
	0.01	*0.30*	*0.02*	*0.01*	*0.07*

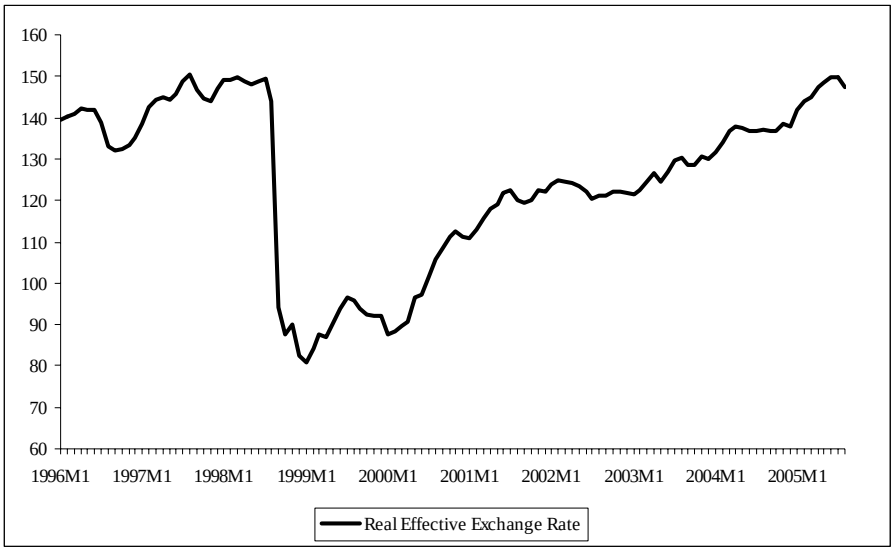
Estimated equation:

$$i_t = (1-\lambda)\cdot[\gamma_0 + \gamma_1 \cdot \pi_{t+n} + \gamma_2 \cdot (\Delta_{12} y_t - \Delta_{12} y_t^*) + \gamma_3 \cdot \Delta e_t] + \lambda \cdot i_{t-1} + \mu_t$$

Note: The dependent variable is the monthly average of the daily money market rate (IFS). We obtained a monthly series for GDP by extrapolating the quarterly index of real GDP (Goskomstat), using monthly observations of industrial production (Goskomstat) and unemployment (Rosstat) as indicators, following the procedure developed in Chow and Lin (1971). The estimates are obtained by GMM estimation. The optimal weighting matrix was obtained from first step two-stage least squares parameter estimates. For each element z in the instrument set iv_t we include lags: $z_{t-1}, ..., z_{t-12}$. The instrument set iv_t includes lagged values of inflation, output gap, exchange rate, federal funds rate and money market rate. Using a J-statistic, we can never reject the null hypothesis that the overidentifying restrictions are satisfied. All equations include a dummy variable that accounts for the August 1998 crisis. The sample period is 1996:01 - 2005:8. The number of observations in the estimation sample is 81. Standard errors are reported in italics. Bold numbers indicate significance at the 1 percent level.

Next, we assess the CBR's exchange rate stability objective by including different measures for the exchange rate target. Since 2003, the CBR has set maximum appreciation rates for the real effective exchange rate (REER). Figure 1.2 shows the evolution of the REER. In August 1998, the CBR had to devalue the ruble and abandoned its crawling peg policy with respect to the Rb/USD exchange rate, following

Figure 1.2: Monthly log of the real effective exchange rate of the ruble (1996:1–2005:8). Source: IMF International Financial Statistics.



speculative attacks and the Russian government's default on its treasury bills. Because of increasing oil prices, the CBR started to put more weight on retaining the currency from further appreciating and set upper limits to real appreciation (Esanov et al., 2005).

First, we include the log of the real effective exchange rate. The coefficient γ_3 then indicates whether the CBR reacts to deviations of the long-run, steady-state values of the REER. Second, we allow for somewhat more complex dynamics, by including both the current and the one-period lagged log of the REER. A higher than normal exchange rate would lead the CBR to relax monetary policy by lowering the short-term interest rate today ($\gamma_3 < 0$), but partially offset its initial reaction in the next period ($\gamma_4 > 0$; $|\gamma_3| > |\gamma 4|$) (Taylor, 2001). The results in Table 1.3 however indicate that the CBR does not react to exchange rate deviations from the target rate (line 1) but rather adjusts the short-term interest rate following *changes* in the REER. Indeed, the coefficient estimates in line 2 indicate that $\gamma_3 < 0$ and $\gamma_3 \approx -\gamma_4$, such that the inclusion of the log difference in the REER in line 3 as a target seems more appropriate. A 1 percent appreciation of the REER induces a 1.08 percent reduction in the CBR's target rate (1.08*0.47 percent reduction in the money market rate). Moreover, the high coefficient estimates for γ_0 in lines 1 and 2 suggest that there is some misspecification when not including the change in the

REER. The estimation results presented in lines 4 to 6 in Table 1.3 corroborate these results for the nominal effective exchange rate. Our baseline estimation is therefore shown in line 3 in Table 1.3. First, the estimates for the smoothing parameter, λ, indicate that the CBR attaches a relatively high weight to the target rate, and therefore smooths its interest rate decisions less gradually compared to what is found in the literature for other countries. Specifically, a 1 percent increase in the target rate leads to a 53 basispoint increase in the money market rate, but increases the next periods interest rate with only 47 basispoints compared to over 90 basispoints in e.g. the US and Germany in 1979-1993 (Clarida et al., 1998). The coefficient on the inflation gap, γ_1, indicates that a 1 percent rise in one year ahead expected inflation will induce the CBR to raise nominal interest rates by 55 basis points. The CBR does not seem to succeed in raising *real* rates in response to inflationary pressures.[25] Taken together, the estimates for the inflation gap, γ_1, and the change in the REER, γ_3, indicate that the CBR prefers not to let its currency appreciate, even at the cost of not meeting its inflation target. Figure 1.3 plots the actual money market rate versus the implied target rate for the baseline equation.

[25] This is because γ_1 is not significantly larger than 1. This is consistent with the findings in Esanov et al. (2005).

Table 1.3: CBR reaction functions: Forward-looking Taylor rules using different exchange rate targets.

	λ	γ_0	γ_1	γ_2	γ_3	γ_4
Real effective exchange rate						
(1)	**0.49**	2.48	**0.56**	**0.08**	-0.01	
	0.01	*3.41*	*0.02*	*0.02*	*0.01*	
(2)	**0.46**	7.87	**0.55**	**0.11**	**-1.08**	**1.07**
	0.01	*4.82*	*0.02*	*0.03*	*0.09*	*0.09*
(3)	**0.47**	0.07	**0.55**	**0.14**	**-1.08**	
	0.01	*0.28*	*0.02*	*0.03*	*0.09*	
Nominal effective exchange rate						
(1)	**0.49**	7.00	**0.59**	**0.08**	-0.02	
	0.01	*5.04*	*0.02*	*0.02*	*0.01*	
(2)	**0.49**	**-37.88**	**0.43**	**0.34**	**-0.75**	**0.83**
	0.01	*6.38*	*0.03*	*0.03*	*0.10*	*0.10*
(3)	**0.47**	**-1.05**	**0.57**	**0.23**	**-0.72**	
	0.01	*0.31*	*0.02*	*0.03*	*0.08*	

Estimated equation:

(1)

$$i_t = (1-\lambda)\cdot[\gamma_0 + \gamma_1 \cdot \pi_{t+n} + \gamma_2 \cdot (\Delta_{12} y_t - \Delta_{12} y_t^*) + \gamma_3 \cdot e_t] + \lambda \cdot i_{t-1} + \mu_t$$

(2)

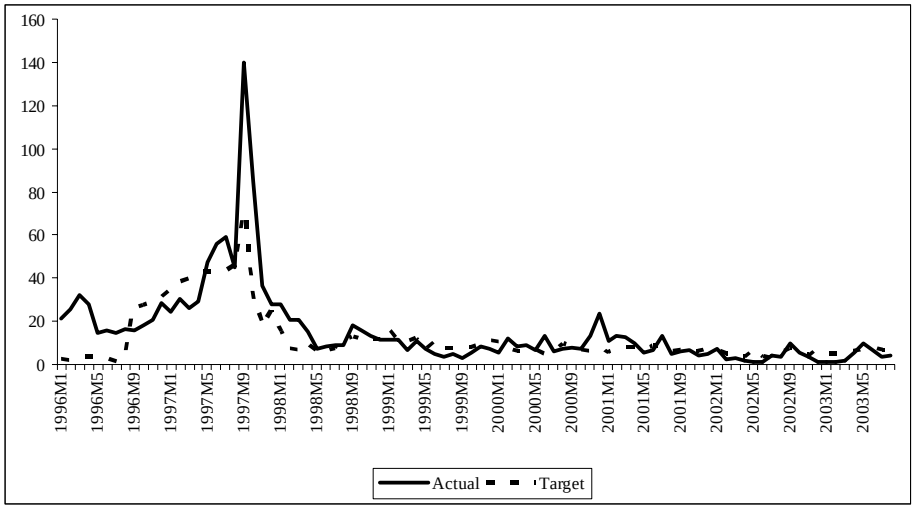
$$i_t = (1-\lambda)\cdot[\gamma_0 + \gamma_1 \cdot \pi_{t+n} + \gamma_2 \cdot (\Delta_{12} y_t - \Delta_{12} y_t^*) + \gamma_3 \cdot e_t + \gamma_4 \cdot e_{t-1}] + \lambda \cdot i_{t-1} + \mu_t$$

(3)

$$i_t = (1-\lambda)\cdot[\gamma_0 + \gamma_1 \cdot \pi_{t+n} + \gamma_2 \cdot (\Delta_{12} y_t - \Delta_{12} y_t^*) + \gamma_3 \cdot \Delta e_t] + \lambda \cdot i_{t-1} + \mu_t$$

Note: The dependent variable is the monthly average of the daily money market rate (IFS). We obtained a monthly series for GDP by extrapolating the quarterly index of real GDP (Goskomstat), using monthly observations of industrial production (Goskomstat) and unemployment (Rosstat) as indicators, following the procedure developed in Chow and Lin (1971). The estimates are obtained by GMM estimation. The optimal weighting matrix was obtained from first step two-stage least squares parameter estimates. For each element z in the instrument set iv_t we include lags: $z_{t-1}, ..., z_{t-12}$. The instrument set iv_t includes lagged values of inflation, output gap, exchange rate, federal funds rate and money market rate. Using a J-statistic, we can never reject the null hypothesis that the overidentifying restrictions are satisfied. All equations include a dummy variable that accounts for the August 1998 crisis. The sample period is 1996:01 - 2005:8. The number of observations in the estimation sample is 81. Standard errors are reported in italics. Bold numbers indicate significance at the 1 percent level.

Figure 1.3: Target rate ($\gamma_0 + \gamma_1 \cdot \pi_{t+n} + \gamma_2 \cdot (\Delta_{12} y_t - \Delta_{12} y_t^*) + \gamma_3 \cdot \Delta ee_t$) versus actual money market interest rate, percentage (1996:1 - 2004:08).



1.3.2 Bank supervision and monetary policy

To capture the CBR's prior knowledge of individual bank health acquired through supervision, we construct several monthly aggregate "bank sector indices" (BSI) that reflect the banking sector's health. We assume that in each month t, the CBR uses the widest information set possible to gauge individual and aggregate bank health. Figure 1.4 illustrates the sequence of information arrival at the CBR.

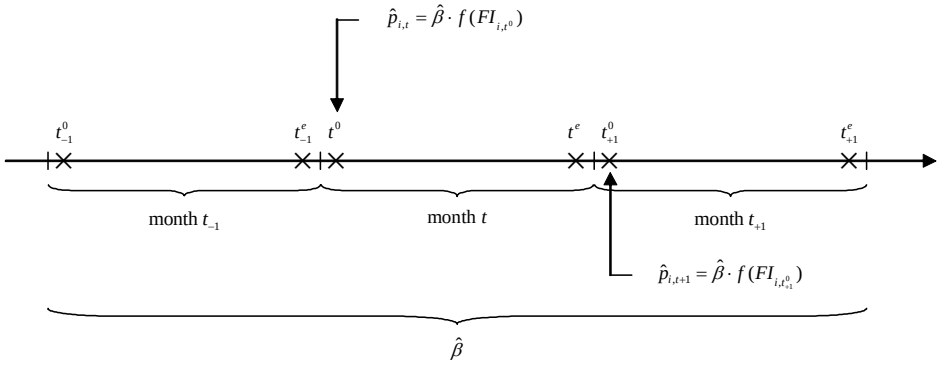
At the beginning of each month t, the CBR observes financial information of all banks at time t^0 which reflects balance sheet and income statement information for the previous month t_{-1}. At the end of each month t, at time t^e, the number of bank failures for month t is known. At time t^e all information from month t can be used to calculate an individual bank's failure probability. Based on the estimation results of an aggregate failure prediction model we obtain:[26]

1. an aggregate coefficient vector, $\hat{\beta}$, which we use to construct

2. bank-specific failure probabilities, $\hat{p}_{i,t}$ (predicted failure probabilities scaled between 0 and 100), which reflect each bank i's failure probability at time t, based on financial information FI of month t_{-1} observed at t^0.

[26] More detailed information on the estimation results for the failure prediction model is presented in appendix 1.A.

Figure 1.4: Sequence of information arrival at the CBR.



To obtain an aggregate bank "stress" indicator, we first construct an unweighted average of the bank-specific failure probabilities:

$$\overline{P_t} = \frac{1}{I_t} \sum_{i}^{I_t} \hat{p}_{i,t}, \tag{1.4}$$

in which I_t is the number of banks still operative in month t. Higher levels of $\overline{P_t}$ will indicate higher average vulnerability of the banking sector. Of course, it is unlikely that the CBR would take such an average at face value in assessing the banking sector's health. More likely, we surmise that the CBR considers the size and interbank linkages of banks most likely to fail. We therefore construct an aggregate indicator that takes into account the CBR's concern over those banks that are most likely to fail and represent some sort of systemic threat in the event of their failure. Banks that represent a large share of the banking market's total assets may be very costly to close down, and therefore receive most attention by the CBR when assessing the banking's sector aggregate health. Assume that the CBR focuses on the cumulative market share of bank assets held by banks most likely to fail and define:

$$BSI_t = \sum_{i}^{\forall i \in BAD_{i,t}} MS_{i,t} * \frac{\hat{p}_{i,t}}{100}, \tag{1.5}$$

in which $BAD_{i,t} = \left\{ i | \hat{p}_{i,t} > 90^{th} \; percentile \; of \; \hat{p}_t \right\}$, $\hat{p}_t = \{\hat{p}_{1,t}, \hat{p}_{2,t}, ..., \hat{p}_{I_t,t}\}$ and $MS_{i,t}$ is the market share of bank i in month t in total bank assets. BSI_t then captures the cumulative market share of the 10 percent of banks most likely to fail. When the CBR uses this information in the conduct of monetary policy, higher values for BSI_t are expected to lead to lower interest rates to ease bank balances. Similarly,

the CBR may attach greater importance to banks that are active on the interbank market or represent a large market share of deposits. We therefore include three indices in which $MS_{i,t}$ either reflects market shares in total bank assets, interbank liabilities or deposits. Finally, we include a measure that only evaluates the aggregate failure probability of the state-owned banks (SOBs): Sberbank, Vneshtorgbank and Vnesheconombank, and their regional branches:

$$SOB_t = \frac{1}{S_t} \sum_{i}^{S_t} \hat{p}_{i,t} * S,$$

in which S is a dummy variable that is one if a bank is state-owned, zero otherwise, and S_t is the number of SOBs operating in month t.

To test the hypothesis that the CBR is using supervisory information in its conduct of monetary policy, we include another target variable, BSI, with coefficient γ_4 in our regressions. Table 1.4 presents the results for the benchmark Taylor rule when including supervisory information through different measures of poor bank health, and adds an extra line that only takes into account the SOBs' average failure probability (as opposed to overall banking sector vulnerability). Line 1 reproduces the baseline estimation that includes the output gap growth rate and the monthly change in the real effective exchange rate. Lines 2 to 4 present the results when aggregate bank health is proxied by the cumulative market share of banks most likely to fail. The results indicate that a rise in BSI through increased asset shares of the most troubled banks significantly reduces the money market rate. Specifically, if the market share held by the 10 percent most vulnerable banks increases by 1 percent, this leads to a monetary easing of 1.14 percent through the CBR's target rate. This suggests that a deterioration in bank health of those banks with systemic importance (in terms of assets or regional coverage) results in an easing of monetary policy by the CBR. This is in line with the results of Peek et al. (1999) for the US Federal Reserve. However, the results for interbank liability and deposit shares in lines 3 and 4 seem to suggest otherwise. A worsening of bank health in these regressions leads to no change or even a strengthening of monetary policy. Nonetheless, when only including the SOB's average health (see line 5 in Table 1.4), the results indicate that the CBR puts particular emphasis on SOBs' balance health and thereby impacts monetary policy. If the average failure probability of SOBs increases by 1 percent, the CBR reduces the target rate with 11 percent.

The empirical evidence presented shows indications that monetary policy has been eased somewhat to favor bank balances solely to accommodate sizeable banks and state-owned banks with high failure probabilities. The results for the other

measures capturing commercial bank health suggest that the CBR is otherwise not particularly prone to ease monetary policy to promote banking sector stability.

Table 1.4: CBR reaction functions: The role of supervisory information in monetary policy.

	λ	γ_0	γ_1	γ_2	γ_3	γ_4
Baseline[1]	**0.47**	0.07	**0.55**	**0.14**	**-1.08**	
	0.01	*0.28*	*0.02*	*0.03*	*0.09*	
Including:						
BSI						
assets	**0.47**	**0.79**	**0.63**	**0.25**	**-1.05**	**-1.14**
	0.01	*0.25*	*0.02*	*0.04*	*0.06*	*0.16*
interbank liabilities	**0.46**	**0.75**	**0.55**	**0.09**	**-1.07**	-0.35
	0.01	*0.24*	*0.03*	*0.02*	*0.07*	*0.24*
deposits	**0.45**	0.02	**0.48**	0.02	**-1.02**	**1.62**
	0.01	*0.25*	*0.02*	*0.04*	*0.06*	*0.20*
SOB	**0.48**	**1.62**	**0.58**	**0.26**	**-1.05**	**-11.82**
	0.01	*0.33*	*0.02*	*0.04*	*0.07*	*2.56*

Estimated equation:

$$i_t = (1-\lambda)\cdot[\gamma_0 + \gamma_1 \cdot \pi_{t+n} + \gamma_2 \cdot (\Delta_{12} y_t - \Delta_{12} y_t^*) + \gamma_3 \cdot \Delta e_t + \gamma_4 \cdot BSI_t] + \lambda \cdot i_{t-1} + \mu_t$$

[1]The baseline specification includes: 12 month ahead annual inflation rates; the growth rate of the output gap, estimated by detrending monthly GDP using a quadratic trend; and the log difference of the monthly real effective exchange rate.

Note: The dependent variable is the monthly average of the daily money market rate (IFS). We obtained a monthly series for GDP by extrapolating the quarterly index of real GDP (Goskomstat), using monthly observations of industrial production (Goskomstat) and unemployment (Rosstat) as indicators, following the procedure developed in Chow and Lin (1971). The estimates are obtained by GMM estimation. The optimal weighting matrix was obtained from first step two-stage least squares parameter estimates. For each element z in the instrument set iv_t we include lags: $z_{t-1}, ..., z_{t-12}$. The instrument set iv_t includes lagged values of inflation, output gap, exchange rate, federal funds rate and money market rate. Using a J-statistic, we can never reject the null hypothesis that the overidentifying restrictions are satisfied. All equations include a dummy variable that accounts for the August 1998 crisis. The sample period is 1996:11 - 2003:8. The number of observations in the estimation sample is 68. Standard errors are reported in italics. Bold numbers indicate significance at the 1 percent level.

1.3.3 Extensions for future research

In all estimations, we assume that the CBR's monetary policy can be best understood via forward-looking versions of the Taylor rule using ex post realized values for inflation rather than inflation forecasts. One alternative procedure adds forward-looking measures of inflation directly into the equation. Here, one could use actual forecasts rather than assuming (less realistically) rational expectations on behalf of the CBR. Inflation forecasts can be generated under the assumption that the CBR uses the widest information set available by estimating a macroeconomic model of the Russian economy through e.g. SVAR analysis. Identification of the empirical model, however, requires imposing restrictions on the dynamic behavior of structural shocks. Furthermore, the reliability of the SVAR analysis hinges upon the absence of structural breaks and relative long data availability – two conditions hardly met by Russia at this time. Thus, an intriguing question remains: How useful would supervisory information be to the CBR if it were to use inflation forecasts?

1.4 Concluding Remarks

The empirical results in this chapter suggest that although supervisory information may be useful for monetary policy behavior, it only marginally improves our understanding of what determines monetary policy in Russia. Do these results help answer the question of where supervision efforts should be directed? And more importantly, even when supervision can potentially contribute to monetary policy, how successful has the CBR been in maintaining financial stability through its use of supervisory information in the conduct of monetary policy? The CBR has mainly pursued an exchange rate stability target – to the detriment rather than improvement of bank balances – and has only recently started to target inflation seriously. Using a simple Taylor rule framework, we found indications that the CBR uses its "hands-on" supervisory information to maintain overall financial stability, and to accommodate state-owned banks' balances. The evidence indicates that the CBR essentially caters to the needs of larger banks (particularly regionally important and state-owned banks), revealing a conflict within the CBR's objective function. Moreover, despite privatization commitments, state shareholdings in the banking sector rose after the 1998 crisis and the decision to privatize Sberbank and Vneshtorgbank was postponed until 2007. In addition, low enforcement of prudential regulation and the CBR's inability to maintain banking system stability (e.g. the 1998 financial crisis and deposit runs in the summer of 2004) call into question the rationale

for keeping supervision "in-house" at the CBR.

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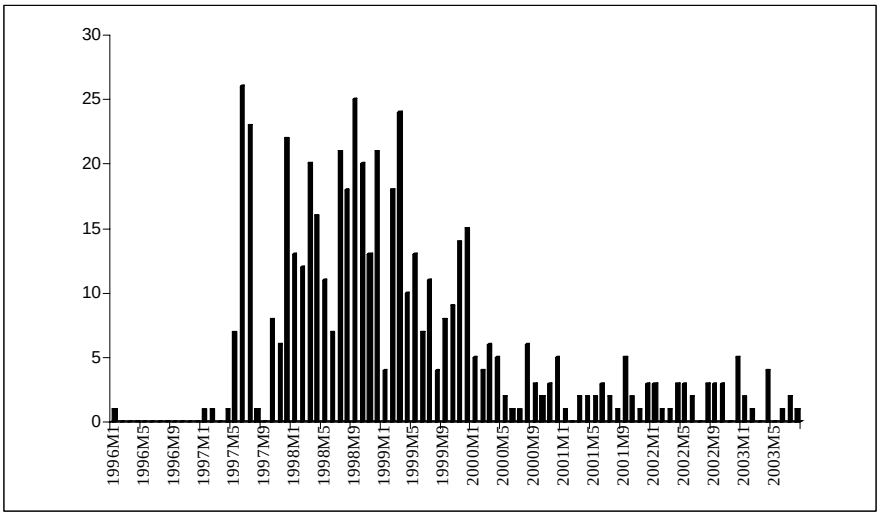
1.A Constructing an aggregate Russian Bank Sector Index (BSI)

We estimate a failure probability model to identify a set of variables (with their respective weights) that capture the financial soundness of banks. The US Federal Reserve determines a CAMEL rating for banks as part of its early warning system to reflect the degree of individual bank health. CAMEL ratings are based upon

Figure 1.5: Monthly number of failures (license withdrawals) within the sample (1995:11-2003:8). Source: Mobile and CBR.



a set of variables that reflect a bank's **C**apital adequacy, **A**sset quality, general **M**anagement and governance, **E**arnings and **L**iquidity management. Based on the monthly Mobile database for the period 1995:11–2003:8, we construct a number of variables that reflect the CAMEL rating categories as closely as possible. Our choice of variables is, however, restricted due to the need for monthly frequency and subsequent availability of the data. The variables which are included for estimating the failure probability model using logit estimation are described in Table 1.5. The dependent variable in the logit regression is a dummy variable, failure, which equals one if a bank's license is revoked before 2003:8, and zero otherwise. Because there can be a significant lag between *economic failure* and *regulatory failure* (following the CBR's de-licensing behavior),[27] we restrict the estimation sample to banks which have positive equity and a non-working assets ratio below 100 percent. We further assume, after estimation, that those banks which have negative capital have a failure probability of 0.99. Summary statistics of the variables in the estimation sample are presented in Table 1.6 for private and state-owned banks (SOBs) separately. Next to CAMEL related variables, we also include a market share and concentration measure in the specification. Figure 1.5 plots the monthly number of failures included in the estimation sample.

[27] Licenses were often not withdrawn until the banks were already illiquid and stripped of assets (Schoors, 1999).

The variable set should be based on the widest information set available to the CBR as well as capture the CBR's private knowledge of bank health compared to public awareness. One drawback of the current variable set is that it cannot appropriately account for qualitative measures such as the management and governance policy of a bank (information which is typically obtainable in conjunction with on-site examinations by the supervisory authority). Unfortunately, since the CBR does not publish bank ratings, we cannot extract this private information. Because we estimate the weights based on the whole period for which we observe the variables (1995:11 - 2003:8), we implicitly assume that the CBR does not only have prior information compared to the public, but also has forward-looking information on banks' balances. The estimation results for the logit model are summarized in Table 1.7.[28] The coefficients of the model are used as weights to predict monthly, bank-specific, failure probabilities and are assumed to reflect individual bank health based on the CBR's knowledge at the end of each month.

Table 1.5: Description of variables used for the logit model[1].

Capital/assets	The capital-to-assets ratio of bank i in month t (%).
Non-working assets/assets	The ratio of non-working assets in total assets of bank i in month t (%).
Return on assets	The ratio of monthly net income to two-month average of assets of bank i in month t (%).
Liquidity	The ratio of liquid assets in total assets of bank i in month t (%).
Non-government claims/assets	The ratio of non-government securities in total assets of bank i in month t (%).
Loans/assets	The loans (to non-financial institutions)-to-assets ratio of bank i in month t (%).
Size (log assets)	The log of assets of bank i in month t.
Regional[2] market share (assets)	The regional market share in assets, calculated as the ratio of bank i's individual assets to the sum of bank assets for region j in month t (between 0 and 100).
Regional[2] Herfindahl (assets)	The regional Herfindahl index, calculated as the sum of squared regional market shares for each region j in month t (between 0 and 10000).

[1] Source: Own calculations based on Mobile database.
[2] Note: We use 80 regions for the calculation of regional market shares.

[28] In contrast to the default models for Russian banks estimated in Peresetsky et al. (2004), we use the entire time series to estimate the weights for the calculation of individual bank failure probability.

Table 1.6: Summary statistics (percentage of total assets).

	Mean		Std. Dev.		Min		Max	
	SOB	Private	SOB	Private	SOB	Private	SOB	Private
Capital	22.40	28.63	17.49	19.29	0.04	0	94.95	99.60
Non-working assets	11.79	10.61	11.41	11.67	0	0	65.25	98.12
Net return on assets	0.06	0.07	1.03	1.95	-13.50	-46.38	14.95	141.34
Liquidity	16.14	19.94	14.63	17.73	0.02	0	89.51	99.71
Government securities	9.15	5.29	13.72	10.61	0	0	78.75	98.10
Loans	36.36	36.58	19.38	21.85	0.01	0	96.56	99.99
Size (log assets)	6.84	4.77	3.31	2.02	-1.12	-2.24	15.83	12.53
Regional market share	17.87	5.07	28.34	13.29	0	0	100	100
Regional Herfindahl index	3735	2900	2437	1889	241	241	10000	10000

Source: Own calculations based on Mobile database. Note: We use 80 regions for the calculation of regional market shares. Number of observations for state-owned banks (SOBs) is 1,890. Number of observations for private banks is 102,200. Sample period is 1995:11 - 2003:8.

Table 1.7: Estimation Results for the Logit Model.

	Coefficient Estimates	Odds Ratios	Mean Values
Capital to assets	-0.0146***	0.9855	28.52
	[0.0030]		
Non working assets to assets	0.0014	1.0014	10.63
	[0.0034]		
Net return to assets	-0.0144***	0.9857	0.07
	[0.0052]		
Liquid to total assets ratio	-0.0551***	0.9464	19.87
	[0.0055]		
Government securities to assets ratio	-0.0342***	0.9664	5.36
	[0.0049]		
Loans to assets	-0.0093***	0.9908	36.58
	[0.0023]		
Size (log assets)	-0.2250***	0.7985	4.81
	[0.0337]		
Regional market share in assets	-0.0237***	0.9766	5.31
	[0.0079]		
Regional Herfindahl index for assets	-0.0001***	0.9999	2915
	[0.0000]		
Constant	1.1710***		
	[0.2123]		
Observations	104090		
Number of banks	1770		
Number of months	94		
Pseudo R2	0.12		
Wald chi2	326.36		
P-Value	0		

The dependent variable in the logit regression is a dummy variable, failure, which equals one if the bank's license was revoked before 2003:8 and zero otherwise. Sample period is 1995:11 - 2003:8. The positive (negative) predictive value of the model is 60 percent (89 percent). 88 percent of the observations are correctly classified. The logit estimations are performed over the pooled sample. Robust standard errors are given in brackets (clustered on banks). *, ** and *** indicate significance levels of 10, 5 and 1 percent, respectively.

Chapter 2

Bank supervision Russian style: Rules versus enforcement and tacit objectives.[1]

2.1 Introduction

Considerable attention has been paid to the various roles of central banks – setter of monetary policy, lender of last resort, banking supervisor, and maintainer of the payments system and financial stability – and to the complementarities and conflicts arising out of these multiple functions.[2] In this chapter, we devote attention to the conflict between systemic stability and individual bank stability, which are explicit objectives for many central banks, and to the scope for regulatory forbearance that may follow from it. To assure systemic stability, central banks typically take on the role of lender of last resort. This comes at the cost of moral hazard by individual banks. This problem can be mitigated through adequate prudential regulation and control (see Dewatripont and Tirole, 1994), which in several countries is in the hands of the central bank too. Bank supervision is meant to give individual banks

[1] An adapted version of this chapter appeared as: Claeys, Sophie, Gleb Lanine, and Koen Schoors (2005), "Bank Supervision Russian Style: Rules versus Enforcement and Tacit Objectives," BOFIT Discussion Paper 10/2005, and William Davidson Institute Working Paper 778.

[2] Peek et al. (1999) conclude for example that the implementation of monetary policy may benefit from information obtained by prudential supervision and control of the banking system. Reversely, monetary policy responsibilities may alter bank supervisory behavior as found by Ioannidou (2005). This finding has heated the debate as to whether bank supervision should be assigned to the central bank or not (Di Noia and Di Giorgio, 1999). The possible conflicts arising from the coexistence of lender-of-last-resort and deposit insurance functions have also been studied (e.g. Sleet and Smith, 2000; Repullo, 2000; Kahn and Santos, 2005).

an incentive to take less risk and thereby alleviate the moral hazard of individual banks that are confronted with a lender of last resort. Rule-based bank supervision may however endanger systemic stability and draw the regulator to a policy of regulatory forbearance. This could for example occur when the regulatory failure of a large deposit bank threatens to affect trust in the deposit market, giving rise to contagion and inflating the risk of systemic instability. This inherent conflict between individual and systemic bank stability is even present in central banks that have neither systemic nor individual bank stability as explicit objectives[3] – all central banks need a stable banking system to be able to conduct effective monetary policy – and it may cause regulatory forbearance.

The economic literature often refers to this tension created by bank supervision and lender-of-last-resort functions, yet there is no conclusive theory that explains how these roles should be balanced.[4] Central banks also have more obscure incentives for regulatory forbearance. Boot and Thakor (1993) show that regulatory discretion urges reputation-seeking regulators to show more-than-optimal forbearance, since they want to leave their jobs with a clean slate. This tendency to résumé polishing suggests that a rule-based prudential control might be better. Mailath and Mester (1994), on the other hand, show that if regulators cannot commit themselves, temporary forbearance may be the equilibrium outcome. In this vein, Acharya (1996) finds that regulatory forbearance may be optimal if the dead-weight losses of closure are important. Kane (2000) suggests that some banks may simply be too big to discipline adequately (TBTDA), which can lead to undesired *de facto* forbearance. Heinemann and Schüler (2004) analyze how there may be a problem of regulatory capture (see also Laffont and Tirole, 1991) by specific interest groups, which implies that the enforcement of prudential rules is not necessarily optimal for welfare even

[3] In developed economies, bank supervision has tended in recent years to increasingly fall under the auspices of a single authority without central bank involvement. Of course, it is not inconceivable that this trend might reverse in the long run.

[4] The quaint Bagehot rule of 1873 ("lend freely to illiquid but solvent banks at a penalty rate") is still defended by many authors. Goodhart (1988, 1995) puts forward that liquidity should not be denied to any bank a priori, since the difference between illiquidity and insolvency is sometimes hard to discern. Goodhart and Huang (1999) propose that central banks should reduce the moral hazard of individual banks by employing a policy of constructive ambiguity in the bail-out decision. Other authors claim that softer policies will induce truthful reporting of asset quality and ultimately lead to cheaper bank rescues and higher systemic stability (see Povel, 1996; Aghion et al., 1999). Cordella and Yeyati (2003) claim that an ex ante central bank commitment to a bail-out contingent on adverse macro-shocks is welfare-superior to a policy of constructive ambiguity. Freixas et al. (2000) show that, when all banks are solvent, it is optimal for the central bank to prevent a speculative gridlock in the payments system by guaranteeing the credit lines of all banks. They also show that it may be optimal for the central bank to show forbearance towards money-center banks, which is their interpretation of the too-big-to-fail hypothesis (see Wall and Peterson, 1990).

in a situation of unthreatened systemic stability.

We look into the question of regulatory forbearance from an empirical angle by analyzing one of the most intriguing cases of central banking in recent history – Russia. The Central Bank of Russia (CBR) is a young central bank. Since its establishment in 1990, it was entrusted with the role of monetary policy, bank regulation, and bank supervision. The CBR also plays a central role in the money circulation and the payments system and has frequently acted as lender of last resort to secure systemic stability.[5] In our data window, the CBR was active as a commercial bank through its giant subsidiaries, Sberbank and Vneshtorgbank. Hence, its objectives and the potential conflicts arising among them are manifold. We specifically examine the CBR's supervision of Russian commercial banks. The CBR both designs the rules within the framework of the banking law and has sole authority to enforce them. This arrangement, in principle, should prevent turf wars between competing regulatory agencies. However, the design and enforcement of regulatory standards may involve certain trade-offs and conflicts that may lead to excessive regulatory forbearance (Kahn and Santos, 2005). In April 1996, the CBR announced a set of new and revised prudential regulations with which banks had to comply to maintain their bank license. By setting bank standards, the CBR seeks to create incentives for banks to eschew risk. However, such bank standards can only induce the desired effect on bank risk-taking if banks expect enforcement. Proper enforcement dictates license withdrawal as the ultimate penalty for banks that repeatedly and severely violate the rules. We refer to this as the *regulatory failure* of a bank. Regulatory forbearance by the CBR would impair the credibility of its own bank standards, resulting in soft legal constraints (see Perotti 2002).

We therefore empirically investigate two hypotheses: 1) is CBR de-licensing activity is only driven by enforcement of its own prudential bank standards or also by tacit objectives related to the systemic stability of the banking system and 2) do conflicts between the enforcement of prudential bank standards and tacit systemic stability objectives induce regulatory forbearance. We employ a quarterly panel of Russian banks for the period 1999–2002 and relate license withdrawal to compliance with bank standards and to tacit objectives of the CBR in the large domain of systemic stability. Economic bank failure only enters our analysis as a control variable. Controlling for economic failure, our results suggest that systemic stability objectives skew the license withdrawal decision of the CBR and show regulatory forbearance

[5] In the Banking Supervision Report of 2004, the CBR explicitly acknowledges that one of its key objectives is to "maintain the stability of the Russian banking system and guarantee protection of the interests of creditors and depositors".

for certain bank standards. More specifically, our results indicate regulatory forbearance by the CBR for large deposit banks (safeguarding depositor trust), banks that are active on the interbank market (safeguarding interbank market stability), and banks that operate in highly concentrated regional bank markets (safeguarding minimal bank competition). Furthermore, the CBR will be less inclined to withdraw individual bank licenses when there are 'too many banks to fail'. Hence, we can infer that the systemic stability objectives of the CBR conflict with its rule-based bank supervision. Indeed, some of the tacit objectives even increase regulatory forbearance. The observed biases in the CBR's de-licensing behavior are therefore best understood as the result of conflicting objectives at the heart of the CBR rather than as a case of pure regulatory discretion.[6] This does not only shed light on the behavior of the CBR, but more generally reveals that the conflict between individual and systemic bank stability can induce regulatory forbearance.

The next section gives an overview of the Russian banking sector and the process of bank creation and destruction in Russia during the last 15 years. Section 3 explains our empirical approach, focusing consecutively on the estimation methodology, the data and the empirical hypotheses. In section 4, we estimate a panel logit model and interpret the results. In section 5, we discuss a number of robustness checks. Section 6 concludes.

2.2 The Russian banking sector in a nutshell

2.2.1 Problems of the Russian banking sector

The Russian commercial banking sector suffered from serious problems in its first decade of existence. And even today, Russian commercial banks have yet to adequately take up the role of intermediation between savings and investments.

Early in transition, banks clearly preferred speculation to lending (Schoors, 2001). Lending to the economy as a percentage of total banking assets sank year after year until 1999 and has not spectacularly improved since then. In 2003, bank assets reached only 42.1% of GDP and loans to the non-financial sector were still just 17.0%. Bank credits financed as little as 4.8% of fixed investment in 2003.[7] Yet this behavior appears quite rational in hindsight. Bank lending was depressed by huge information asymmetries between banks and their prospective customers, and by the lack of screening and monitoring skills in the banks themselves and the

[6] Malyutina and Parilova (2001) argue that the CBR bases its closure policy on discretion rather than on its prudential regulations. We argue other "tacit" objectives are at stake.

[7] Data from the CBR Bulletin of Bank Statistics.

economy at large. Banks were unable to identify good potential borrowers (Brana, Maurel and Sgard, 1999), so they preferred not to lend at all. Moreover, the vast amount of tiny banks and the lack of a transparent information system about credit histories may also have depressed lending (Pyle, 2002).

The little lending that did take place was mainly to connected parties or to the government (under various forms), as witnessed in the August 1998 crisis when several large banks became illiquid and insolvent overnight after the government defaulted on its treasury bills. The widespread connected lending is partly explained by historical factors. The successors of the former specialized state banks were reluctant to restructure and continued to lend passively to their owners (Schoors, 2003). Moreover, many of the newly founded private banks had been captured by their dominant shareholders. Such "pocket banks" operated as treasuries for a firm or a group of firms rather than independent banks; they preferred "putting their money where their mouth is" to normal relationship lending. This made the problem of connected lending or insider lending omnipresent in Russia. Most banks now predominantly lend to connected agents, regardless of the viability of the lending project, and have very weak monitoring incentives (Laeven, 2001). Note that the government, too, is to some extent a connected party, because several banks are owned by local, regional, or national governments. At the start of 2003, Russia had 23 banks in which the state (federal or regional authorities) held majority stakes, the regional authorities held minority stakes in many more banks and a large number of state-controlled enterprises were part-owners of banks (Tompson, 2004).

Loan quality problems have been endemic from the start. The problem of connected lending, the softness of legal constraints, the presence of large information asymmetries and the lack of screening and monitoring skills implied that the Russian banking sector was riddled by bad loans well before the 1998 crisis. A leaked analysis of Russian banks after the crisis of August 1998 shows that the major cost for banks was not the devaluation loss or the government default on treasury bills (GKOs), but bad loans abandoned years earlier.[8] The banks had merely hidden these bad loans. Schoors and Sonin (2005) explain that the Russian banking system was stuck in a passivity trap in which it was rational for banks to hide bad loans rather than attempt to collect them. The real growth that has taken place since 1999 has allowed Russian banks to "grow" their way out of bad loans. Nevertheless loan quality is a flow, rather than a stock variable. It does not improve unless the nature of the flow changes.

[8] See "The newly-wed and the nearly dead," *Euromoney*, June 1999.

The Russian banking sector has also suffered from poor capitalization, especially considering the poor quality of assets and the large exposure to exchange rate risk.[9] This overexposure was revealed when the devaluation in August 1998 changed capital of many Russian banks from positive to negative overnight (Perotti, 2002). The CBR has steadily raised capital standards since 1999, but bank capitalization is still substantially lower in Russia than in developed banking markets. Our data reveal that average capitalization is substantially higher than the weighted average capitalization, indicating that the largest banks have the weakest capitalization – not exactly a comforting finding. The difference is most pronounced when total bank deposits are used as weights, implying that the buffer of capital is lowest in the banks that need it most.

The above-mentioned factors (poor capitalization, excessive speculative risk, endemic bad loans, connected lending, etc.) led to a large number of bank failures. The extremely soft legal constraints faced by banks encouraged asset stripping by management and owners, leaving the creditors to bear the brunt of the cost of failure (Perotti, 2002). In addition there was a large number of financial scandals and scams in which depositors were cheated by crooks who fled with their money. As a result, popular distrust of the banking system grew and depositors shifted their money to Sberbank and Vneshtorgbank – two banks that are still largely in state hands. As a result, Sberbank and Vneshtorgbank continue to dominate a highly concentrated deposit market (OECD, 2004).

In the period under study, the Russian banking market consisted of a number of separated regional markets. Some regions enjoyed an acceptable amount of competition, while other regions exhibited high concentration. The average region has only two bank branches per 100,000 inhabitants[10], which is quite low by European standards. The large regional differences can also be seen from the summary statistics on regional Herfindahl indices for bank assets in Table 2.2a, and from the substantial differences in regional interest rates and even exchange rates (see Figures 3 and 4).[11]

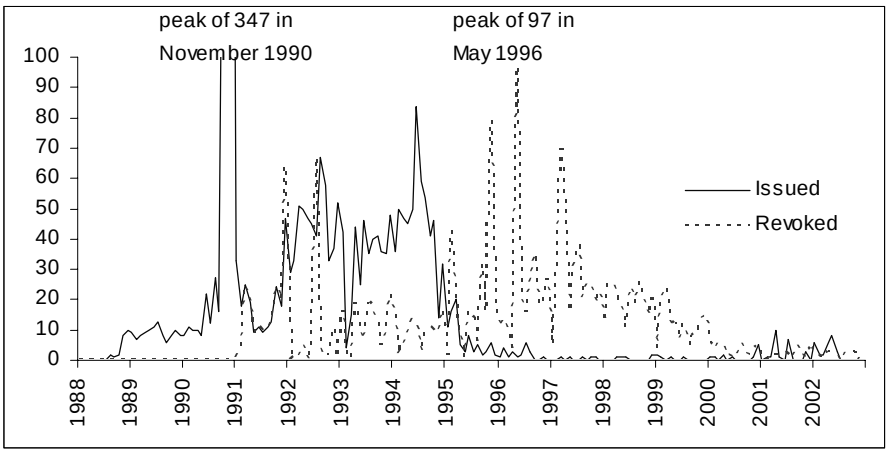
Restructuring of the banking sector was clearly long overdue already in 1998. Several observers and notably the IMF repeatedly expressed hope that the 1998 crisis would finally urge the CBR to undertake serious bank restructuring. In the immediate aftermath of the crisis, the CBR indicated it expected 400 to 600 banks to disappear. These expectations were quickly dashed, mainly because the banks

[9] See, for example, Buch and Heinrich (1999).

[10] Own calculations, based on data from the CBR (bank branches per region) and Goskomstat (population in thousands).

[11] These numbers can be found in the CBR publication Bulletin of Bank Statistics, available in English on the CBR website.

Figure 2.1: Bank creation and bank destruction in Russia (monthly data). Bank creation is defined as the number of licenses issued; bank destruction is defined as the number of licenses withdrawn. Source: CBR.



themselves faced soft legal constraints. Many of the Russian banking system's most salient characteristics persist to this day.

2.2.2 An overview of bank creation and bank destruction in Russia

Before analyzing the bank licensing behavior of the CBR, an introductory description of the main trends in CBR bank licensing is appropriate.

Figure 2.1 shows the detailed dynamics of monthly bank creation and destruction in Russia. It is based on data posted on the CBR website. The solid line shows new bank registrations, while the dotted line shows bank license withdrawals in a given month. There is a striking peak of bank creation at the end of 1990: 228 banks were created in October 1990, 347 in November 1990, and 269 in December 1990. This peak is to a large extent explained by the secessionist privatization of the former state banks (*spetsbanki*) that started in 1988 (i.e. well before the collapse of the Soviet Union in December 1991) and yielded over 600 often unrecognizable state bank successors (Schoors, 2003). At the same time, individuals, governments, corporations, and other organizations created a number of new banks. Bank creation by economic agents other than former state banks took off spectacularly in 1992–1994. Many of these new private banks, so-called "pocket banks", were captured by their dominant shareholders. This made the problem of connected lending omnipresent, leaving commercial banks with only very weak monitoring incentives

(Laeven, 2001). In addition, many of these new banks were more like casinos than banks and preferred speculation to lending. The vast amount of tiny banks and the lack of a transparent information system about credit histories may have further depressed lending (Pyle, 2002). The hike in bank creation partly reflected the relaxed bank supervision under Viktor Gerashenko. He was the last president of the defunct Gosbank, the former state monobank that ceased to exist, along with the Soviet Union, at the end of December 1991. He became president of the CBR in the summer of 1992 after the hard-nosed, but inexperienced, CBR president Matyukhin had been outmaneuvered by the industrial lobby. The exchange rate crisis in October 1994 cost Gerashenko his position as president; he was replaced with the more reform-minded Tatiana Paramonova. The bank creation numbers suggest that bank supervision was tightened after 1995 under her reign. She was replaced by Dubinin in early 1996. With Sergei Dubinin at the helm of the CBR, stricter minimum capital requirements were introduced in April 1996. The process of bank creation dropped sharply and remained very low from 1996 onward. Bank creation did not revive until 2001.

Figure 2.1 illustrates how bank destruction follows a different pattern altogether. There is a peak of license withdrawals in the first half of 1992 when the CBR was headed by Matyukhin. After his replacement in mid-1992 with Gerashenko, the number of license withdrawals dropped substantially. From mid-1992 to end-1994, the CBR had a very relaxed policy towards bank licensing and bank refinancing (Schoors, 2001). This left Russia with well above 2,000 banks at the end of 1994. Paramonova's first sweep of the banking sector in early 1995 targeted cleaning up the exchange-rate crisis mess. The second wave of license withdrawals peaked in November 1995 in the aftermath of the meltdown on the Russian interbank money market in August 1995. Apparently, the CBR reacted to crises by enforcing some of its regulations ex post, a pattern of behavior it has repeated since. Once the new chairman of the CBR, Dubinin, came into power he swept through licenses in May 1996 on the heels of new minimal capital requirements, then repeated this exercise in March 1997. The majority of banks that lost their license under Paramonova and Dubinin were tiny banks without political clout. In several cases, the de-licensed bank was already bankrupt or looted by its directors. In this sense the CBR followed events rather than anticipating them.

With the crisis of August 1998, Gerashenko was reinstalled at the helm of the CBR. He achieved the stabilization of the banking system and unclogged the jammed payments system by an unconditional bail-out of a number of banks. Officially, the clean-up was led by the "Agency for the Restructuring of Credit Organizations"

(ARCO).[12] In fact, ARCO was underfunded and achieved little in the way of bank restructuring. Figure 2.1 shows that the pace of license withdrawals did not pick up, but rather fell precipitously. This not only reflected Gerashenko's weak policy but also resulted from a striking, but well-hidden, deficiency in Russian law – the exemption of banks from the bankruptcy code, a dreary detail of which many foreign creditors were not fully aware. This ensured that creditors could not easily enforce their claims on banks (Schoors and Sonin, 2005). The banking sector had insisted on this exemption and thereafter was successful in blocking all draft laws on bankruptcy of banks until "The Law on the Restructuring of Credit Organizations" entered into force in March 1999. This legal loophole gave less benevolent banks the opportunity to loot creditors by stripping banks of their valuable assets and transferring them to "bridge" banks, while leaving their liabilities in the defaulting or troubled institutions. This procedure was practiced on a grand scale in the aftermath of the 1998 crisis. Foreign creditors were furious and when the March 1999 law came into force, the IMF strongly pressed the CBR to perform at least some restructuring. As a consequence, several high profile banks lost their licenses, including Promstroibank and Mosbusinessbank, two direct successors of the former specialized state banks. These bankruptcies were however more symbolic than real and convenient to everyone but the creditors. The March 1999 law provided that creditors could only force a bank to bankruptcy after the CBR had withdrawn its license. All too often licenses were only withdrawn after the bank was a stripped, illiquid shell. This pattern was typical of the "mired restructuring" that took place after 1998 (Schoors, 1999).

2.3 Empirical approach

We analyze the enforcement of bank regulations through the licensing behavior of the CBR in the period 1999–2002. This period is chosen for four reasons. First, most of the casinos, exchange offices, tiny banks, and smartly clad crooks had already disappeared from the system by virtue of the successive purges of bank licenses in the period 1995–1997 (see previous section). Second, we consider a period with a consistent regulatory policy, since earlier CBR chairmen had shown widely different supervisory preferences. During 1999–2002, bank licensing behavior is again in the hands of Viktor Gerashenko, who emerged at the head of the CBR after the 1998 crisis. Third, the CBR introduced a new accounting system in 1998 that moved

[12] See Mizobata (2002) and Tompson (2002) for more on this topic.

away from Russian accounting standards (RAS) towards international accounting standards (IAS). Last and most important, the new law on bank restructuring that came into effect in March 1999 gave the CBR a central role in bank restructuring, which was expected to strongly affect the CBR's licensing behavior.

We employ a panel logit model to empirically analyze our hypotheses. To investigate the first hypothesis, namely whether CBR de-licensing activity is not only driven by enforcement of its own prudential bank standards but also by tacit stability objectives, we estimate regressions of the following form:

$$\begin{aligned} Prob(license\ withdrawal)_{i,t} \quad = \quad & c + \alpha'_{i,t-1}\,(economic\ variables) + \\ & \beta'_{i,t-1}\,(tacit\ stability\ objectives) + \\ & \gamma'_{i,t-1}\,(regulatory\ breach\ measures) + \\ & v_i + \varepsilon_{i,t}. \end{aligned} \tag{2.1}$$

The dependent variable is a dummy variable which equals one in the quarter when a bank loses its license, and zero otherwise. We relate license withdrawals to three groups of variables: 1) violations of regulatory standards, 2) variables that capture the tacit objectives of the CBR, and 3) economic (bank- and market-specific) variables. Although our focus is on regulatory failure, we introduce economic variables to control for economic failure. Table 2.1 summarizes the definitions and sources of all variables.

To investigate the second hypothesis, whether enforcement of prudential bank standards and tacit systemic stability objectives conflict with one another, we estimate the specification:

$$\begin{aligned} Prob(license\ withdrawal)_{i,t} \quad = \quad & c + \alpha'_{i,t-1}\,(economic\ variables) + \\ & \beta'_{i,t-1}\,(tacit\ stability\ objectives) + \\ & \gamma'_{i,t-1}\,(regulatory\ breach\ measures) + \\ & \delta'_{i,t-1}\,(breach) * (tacit\ stability) + \\ & v_i + \varepsilon_{i,t}. \end{aligned} \tag{2.2}$$

If regulatory enforcement and tacit objectives conflict with one another, we expect that violating regulatory standards will lead to more license withdrawals, unless tacit objectives skew the CBR's de-licensing behavior towards regulatory forbear-

ance. In both specifications, we allow for bank-specific unobserved heterogeneity, since banks may differ in ways not observed in our dataset. The logit model is therefore estimated under a random effects (RE) assumption.[13] We use data from three sources: Interfaks, Mobile, and the CBR. We describe the datasources in detail in appendix A.

2.3.1 Measuring non-compliance with regulatory standards

The CBR imposes a number of bank standards with which banks need to comply in each quarter (see appendices A and B for a detailed description). When banks do not comply with one or more of these standards, the CBR applies the same actions regardless of the standard breached. The CBR can impose financial fines for non-compliance, but these are not readily observed. We therefore consider the CBR's ultimate penalty for non-compliance, namely license withdrawal. Regulatory enforcement should lead the CBR to withdraw a bank's license if that bank repeatedly and severely violates the rules. For each bank standard, we observe bank-specific scores on a quarterly basis. When a score does not satisfy the standard, we say the standard has been breached. We use this information on breaches to construct several vectors of variables that measure compliance with CBR standards.

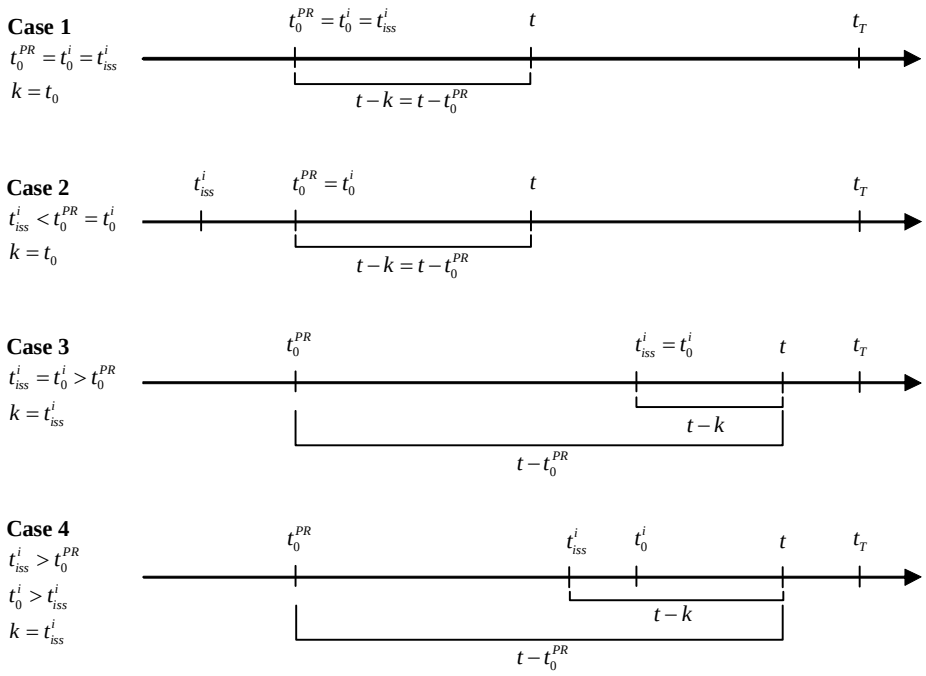
Based on the definition for each bank standard n and its regulatory minimum or maximum imposed by the CBR, we define standard-specific breaches and count breaches per bank and per bank standard. For each quarter, we then correct the number of past breaches for two reasons. First, we want the number of breaches to be time-varying, which implies that the total number of breaches will be higher for later quarters. Second, some banks are created after t_0^{PR}, the first quarter in which we observe standards, which means that they will have fewer bank quarters in the sample and ceteris paribus will register fewer breaches.[14,15] Therefore, we correct the simple sum of breaches for bank i until t by dividing it by the maximal number of possible breaches at time t and multiplying it by the number of breaches that

[13] We assume that there exists some time-invariant bank-specific factor (for example, political strings or managerial skills) that explain part of the license withdrawal probability.

[14] For most bank standards, t_0^{PR} is in 1997:Q2. For N10.1 this is in 1997:Q3 and for N9.1 this is in 1998:Q1 as these standards were introduced later. The data between 1997:Q2 and 1999:Q1 on scores of banks on prudential bank standards were collected from Mobile. For 1999:Q2 -2002:Q4, the scores on bank standards were collected from Interfaks. See appendix A for a detailed description of the different datasources available for the Russian banking sector and their compatibility.

[15] We evaluate the enforcement of bank standards in a period with stable supervisory regime - 1999-2002. Our compliance variables incoporate all information available to the CBR, including information on compliance under previous regimes. This allows the CBR to incorporate the bank's full compliance record in its de-licensing decision.

Figure 2.2: t_0^{PR} marks the first quarter in which we observe bank-specific scores on different standards; t_T marks the end of our sample (2002.4); t_{iss}^i marks the quarter in which bank i's license was issued; t_0^i marks the first observation of bank i; $t_T - t_0^{PR}$ marks the sample period for observing bank standards; $t-k$ is the number of potential breaches at time t; $t - t_0^{PR}$ is the number of quarters used to correct for "late entry" or "late license issuance".



is maximally possible for banks created before t_0^{PR} and still operational at time t. More specifically, we define for each standard n and for each bank i, the number of past breaches at time t:

$$nbreach_{n,i,t} = \frac{\sum_{z=k}^{t} breach_z}{t-k}(t - t_0^{PR}),$$

with *breach* equal to one when a bank violates the rule and zero otherwise, k the start of observations for bank i and t the observed bank quarter for bank i. Figure 2.2 illustrates what this implies for banks with different dates of entry.

In order to construct a first measure of regulatory (non-)compliance, we assume that the CBR is likely to attach greater importance to current breaches than past breaches. Put simply, a bank that has had two violations in the previous two quarters has the same score on *nbreach* at time t as a bank with only two breaches in the

past year, although one might expect the CBR at time t to attach more value to the former than the latter. We therefore construct a vector of compliance variables that discounts past breaches. Discounting past breaches additionally captures the fact that the CBR draws from a larger action set than the observed withdrawing of licenses alone.
Define the weights:

$$\varpi_t = \alpha(1-\alpha)^t, \text{ with } \sum_{t=0}^{\infty} \varpi_t = 1. \tag{2.3}$$

Then the discounted number of breaches for each regulation n and a given bank i at time t is:

$$dnbreach_{n,i,t} = \frac{\sum_{z=k}^{t} \varpi_t(breach_z)}{t-k}(t - t_0^{PR}).$$

In order to interpret *dnbreach* as the discounted version of *nbreach* and make comparison of these two measures more intuitive, we make one final adjustment. The sum of the weights used to calculate *dnbreach* equals unity, while implicitly the sum of the weights used to calculate *nbreach* equals $t-k$. In order to discount the potential number of breaches too, we adjust the measure for *dnbreach* by multiplying by $t-k$, which gives:

$$dnbreach_{n,i,t} = \sum_{z=k}^{t} \varpi_t(breach_z)(t - t_0^{PR}). \tag{2.4}$$

To allow the CBR to be more concerned about the average severity of breaches than the number of breaches, we construct a second variable for each standard n:

$$sbreach_{n,i,t} = \frac{\sum_{z=k}^{t} \left(\frac{|\text{score}_z - \text{standard}_z|}{\text{standard}_z} \right)}{t-k}.$$

The deviation of the score from the standard is only counted in the case of a breach; it equals zero otherwise. We take absolute values to ensure that the severity of a breach is always defined as a positive number. Again, the CBR may care more about the severity of current breaches than the severity of past breaches. The discounted severity of breach is then defined as:

$$dsbreach_{n,i,t} = \frac{\sum_{z=k}^{t} \varpi_t \left(\frac{|\text{score}_z - \text{standard}_z|}{\text{standard}_z} \right)}{t-k}.$$

To ensure comparability of the coefficients, we need again to multiply with $t-k$,

which gives:

$$dsbreach_{n,i,t} = \sum_{z=k}^{t} \varpi_t \left(\frac{|\text{score}_z - \text{standard}_z|}{\text{standard}_z} \right). \tag{2.5}$$

There is a final twist in the measurement of compliance variables. For some banks in some quarters, the scores on a number of bank standards are missing. Apparently, banks sometimes fail to report some scores to the CBR. Since non-reported bank scores may be interpreted by the CBR as compliance, non-compliance, or something in between, we introduce a dummy variable for non-reported bank scores in a given bank quarter as a separate variable in the regressions. If at least one score is missing in a given bank quarter, the non-reported scores dummy equals one and zero otherwise (see Table 2.1). In this way, we can explicitly test how the CBR interprets non-reported scores.

2.3.2 Tacit stability objectives of the CBR

Regional banking coverage In the period surveyed, the CBR was worried that banking had become too concentrated in some regions. ARCO indicated it supported some banks with regional networks to avoid certain regions becoming underbanked (Mizobata, 2002; Tompson, 2002). We therefore expect that banks in already highly concentrated regional banking markets are less likely to lose their licenses compared to identical banks in less concentrated regions. As a concentration measure, we use the regional *Herfindahl index*. Regional banking coverage is very stable in our data window, with some very poorly banked and some very well banked regions. The low variability of this variable in our sample implies it is not suitable for explaining quarter-specific variance in the bank license withdrawal behavior of the CBR. Therefore, in the estimations we employ the average of this variable over time such that we have one observation per region.

Systemic stability The CBR's concern for systemic stability is likely to lead to biases in its de-licensing behavior. The CBR may wish to protect banks that are active on the interbank market to minimize the risk of contagion. As a proxy for banks that are active on the interbank market, we use the ratio of *interbank liabilities to total liabilities*. Activity on the interbank market may reflect general bank transparency, safety and health, but we control for this by including the non-reporting variable (see above), the compliance variables (see above) and the return-to-assets ratio and loan quality (see below) in the variables list. Therefore, if the

CBR shows more forbearance for banks with high interbank liabilities, it must be because it cares about systemic stability and contagion.

The CBR may want to protect large deposit banks to avoid deposit runs and maintain confidence in the banking sector.[16] Interestingly, this can be measured by the *bank standard N11* (household deposits over capital). We expect therefore to see forbearance of breaches of N11, since enforcement of this standard is not consistent with other CBR objectives (see appendix B for a more detailed description of this bank standard).

Political influence We include the ratio of *government securities to total assets* to measure government capture. Banks that lend relatively more to the government may have greater political clout and receive protection against de-licensing. When a bank has a substantial amount of government securities in its portfolio, the CBR might prefer not to close the bank if it has an interest in distributing these securities. This was precisely the case for treasury bills (GKOs) prior to 1998 (Malyutina and Parilova, 2001). On the other hand, holding a large share of assets in government securities could be an indication of injuries suffered, because of the government's default on its GKO in August 1998. Note that the resolution of this crisis was not handled even-handedly. Some banks were reimbursed relatively quickly at reasonable discounts. Others had to wait, and were sometimes driven into bankruptcy as a consequence. The non-transparent handling of the crisis does not allow us to calculate the precise bank-specific harm done by the GKO default, but the amount of government claims still in the books may partly reflect the remaining harm done by the default.

The CBR may be less willing to restructure pocket banks, which are often dominated by powerful but closed groups with considerable political clout. Pocket banks tend to be isolated from the rest of the banking sector and rarely accept household deposits. Therefore, from the standpoint of systemic stability, the CBR does little harm by enforcing *bank standards N9.1* and *N10.1*, but it may however have strong political incentives to show forbearance for breaches of these particular standards (see appendix B for a more detailed description of these bank standards).

Bank size *Bank size* may affect bank failure for various reasons. Some banks may be simply too big to fail. This can be justified on the grounds that the collapse of a large bank poses a threat to the banking system as a whole (see Wall and Peterson,

[16] Models of bank runs include Diamond and Dybvig (1983), Postlewaite and Vives (1987), Wallace (1990), Chari (1989), Champ et al. (1996), and Alonso (1996).

1990). There is evidence that the CBR extended credit considerably to the largest banks (Malyutina and Parilova, 2001). It is reasonable to assume that as the costs of closure increased the idea of closing down these banks became more distasteful to the CBR. In this sense, some banks may be too well connected to the CBR to fail. Kane (2000) suggests that some banks may simply be too big to be disciplined adequately (TBTDA), rather than too big to fail. Such situations create problems of undesired *de facto* forbearance even in developed market economies such as the US. This was undoubtedly a problem in Russia, where the understaffed and relatively young department of bank supervision was not up to the task of inspecting the intricate balance sheets of huge banks engaging in complex activities. We include the variable *size* in our regressions to capture any of these effects. Both theories predict a negative relation between bank size (the log of total assets) and bank license withdrawal probability.

Too many too fail When many banks breach the regulatory standards at the same time, the CBR may find it optimal to refrain from withdrawing individual bank licenses. When too many banks are found to be insolvent, a central bank may prefer regulatory forbearance over the costly closure of a large number of banks (Mitchell, 1998). We include the *aggregate number of breaches* as an extra variable in the regressions to test this hypothesis.

2.3.3 Economic variables

To control for economic failure we include a set of bank- and market-specific variables. A high *return-to-assets* ratio should reduce license withdrawal probability. The *cost-to-assets* ratio is expected to correlate positively with license withdrawal probability. The ratio of *interbank liabilities to total liabilities* is an indicator of the liquidity of liabilities and should correlate positively with license withdrawal (Calomiris and Mason, 2000). Thus, either the CBR protects banks that are active on the interbank market (as argued above) or highly liquid liabilities make banks more vulnerable and therefore more likely to fail as suggested by Calomiris and Mason (2000). The *regional market share in bank assets* is a proxy for market power. In the structure-conduct-performance framework (Berger, 1995) the effect of market power on license withdrawal is expected to be negative. Poor loan quality, measured as the ratio of *non-performing loans to total loans*, should increase the license withdrawal probability. The ratio of *total reserves to total assets*, as an indicator of absolutely safe liquidity, should reduce license withdrawal probability. We control

for inflation by including a deflator. We also include a dummy variable that equals one when the bank is registered in the Moscow region, and zero otherwise. Compared to other regions, Moscow-based banks face more competition which makes them more vulnerable to economic failure. To illustrate this, Figures 2.3 and 2.4 show that intermediation as well as exchange rate spreads are significantly lower in Moscow compared to the regional average. The Moscow dummy accounts for a possible licensing bias for Moscow-based banks.

2.3.4 Summary statistics and correlations

Summary statistics for all variables are given in Table 2.2. Note that we exclude Sberbank, Vneshtorgbank, Vnesheconombank, as well as their regional branches from the sample. As they are totally dominated by the CBR, their survival is ensured in any case. This leaves us with over 19,000 bank quarters of data available for estimations. Table 2.2a shows summary statistics for the economic variables and the variables that measure tacit CBR objectives. The Moscow control variable reveals that 49% of bank quarters are from banks registered in the Moscow region. All other variables show reasonable average values, although in some bank quarters they reach the maximum of 100%.[17] Note however in the last column of Table 2.2a that the number of bank quarters with extreme observations is fairly limited. We choose not to exclude any of these banks, since they are all subject to the same bank standards, whose enforcement is under scrutiny in this chapter. We are only interested in the question whether the CBR enforced its own bank standards and whether other tacit objectives interfered with regulatory enforcement. The results are however robust to the exclusion of these extreme observations.

The summary statistics of regulatory compliance variables in Table 2.2b reveal that the maximum number of breaches is disconcertingly close to 23 for some bank standards, i.e. the number of bank quarters used for the calculation of the compliance variables. Apparently, some banks breached some standards in nearly all bank quarters and still managed to keep their licenses. The most severely breached bank standard is the deposits-to-capital ratio N11, closely followed by a number of liquidity standards and the capital adequacy standard. Bank standard N11 (households' deposits-to-capital ratio) is on average breached most often (on average in 1.52 quarters in a total of 23 quarters) and the breaches are on average relatively severe (13% away from the standard). The capital adequacy standard is also breached

[17] In three regions (Kursk Region, Republic of Karelia and Republic of Marii El), there is only one bank active between 1999:Q3 - 2002:Q4. For these regions, our sample average of the Herfindahl index reaches maxima above 9,500.

Figure 2.3: Average intermediation spreads for firms and households: regional average versus Moscow region. Source: own calculations based on CBR. Note: Intermediation spreads are calculated as the difference between the region's lending rate and the region's deposit rate.

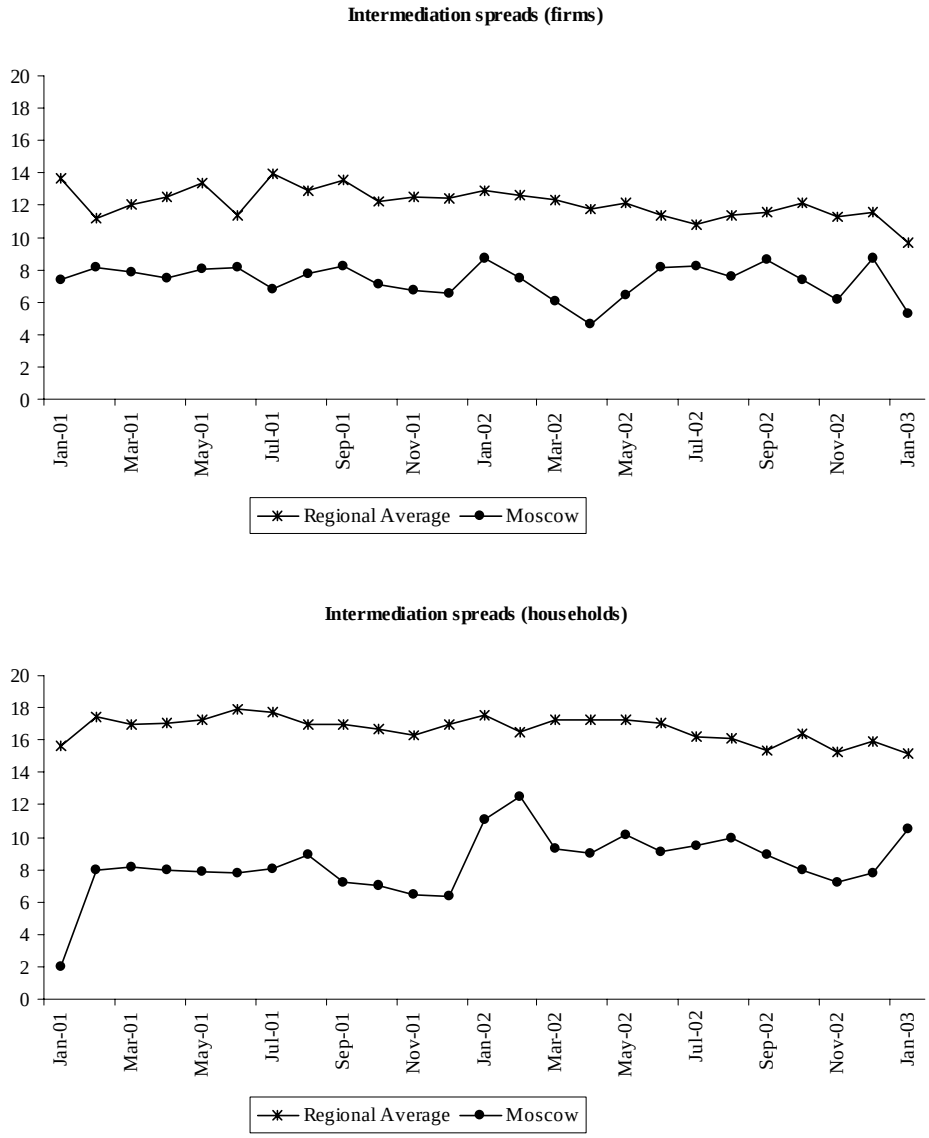
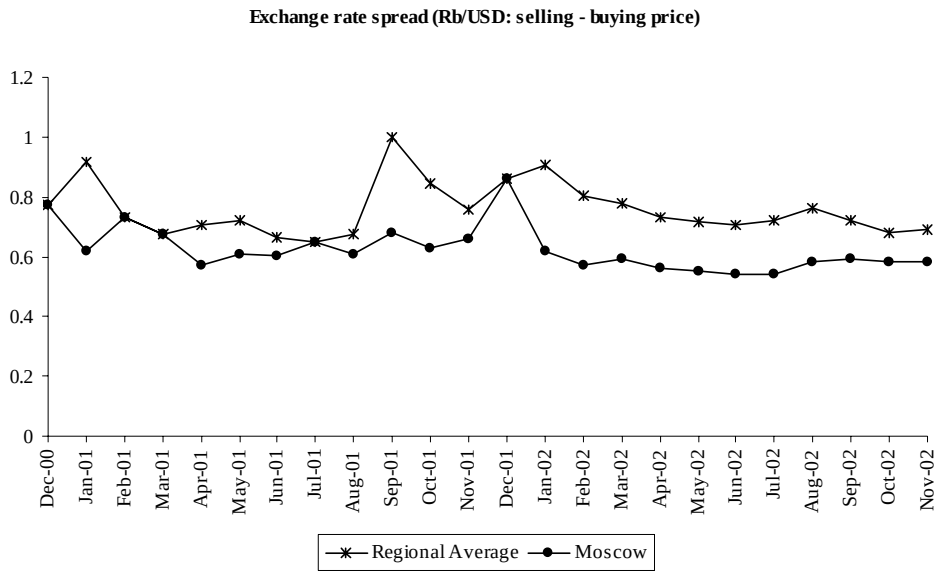


Figure 2.4: Average spreads between the selling and buying price of Rb in USD: regional average versus Moscow region. Source: own calculations based on CBR. Note: exchange rate spreads are calculated as the difference between the region's selling price and the region's buying price.



quite often (on average in 0.52 quarters out of 23) and relatively severely (on average 18% away from the standard). Still, on average banks breach the standards rather infrequently and not terribly severely.

Correlations between the variables are shown in Table 2.3. There is one noteworthy source of correlation; the compliance variables of liquidity standard N5 seem to be highly correlated to compliance with other liquidity standards. This is not surprising given the very general definition of this liquidity standard. Moreover, one could question the usefulness of such a liquidity standard in the Russian setting. Indeed, standard N5 only looks at very broadly defined liquid assets and neglects all aspects of assets/liabilities management. Banks that score high on this standard typically hold few real bank assets (loans).

Table 2.4 reveals that the more than 19,000 bank quarters cover 1,443 banks (194 of which lost their licenses in the sample period). Most license withdrawals were, according to the CBR, due to violations of bank regulations (over 30%) or compulsory bankruptcy (over 64%). Of course, these two reasons for license withdrawal may overlap. Economically bankrupt banks tend to violate a number of bank standards. Hence, compliance and economic variables should do well in picking up these license withdrawals in the empirical analysis.

2.4 Results

Table 2.5 presents the results for the logit model defined in (2.1). We use as measures for violation of regulatory standards the discounted number of breaches and the discounted severity of breaches, defined in equations (2.4) and (2.5). For each of these two measures, we show estimates that assume the CBR puts increasingly less weight on past breaches, as defined in equation (2.3), by employing increasing values of the discount parameter, α.

Our first observation is that the economic variables do reasonably well at explaining license withdrawal. Less profitable banks, banks with higher costs, banks with poorer loan quality, and banks with less liquidity are all more likely to lose their bank licenses. However, high interbank liabilities in themselves do not increase economic vulnerability as predicted by Calomiris and Mason (2000). Instead, higher interbank liabilities tend to reduce the likelihood of license withdrawal, but only significantly in the first specification with the number of breaches as compliance variable. This suggests that the CBR is more reluctant to withdraw licenses from banks that are active on the interbank market and provides a first indication that tacit objectives may also guide the CBR in its licensing policy. Holding a large

amount of government securities relative to assets tends to increase the likelihood of license withdrawal. This is probably still the effect of lingering liquidity problems that follow from the government default on treasury bills in August 1998.

The tacit CBR objectives identified in our study do surprisingly well in explaining bank de-licensing behavior. While controlling for economic and regulatory failure, our results indicate that banks in poorly-banked regions are less likely to lose their licenses as shown by the strongly significant coefficient on the regional Herfindahl index. The negative coefficient on size indicates that large banks are less likely to face license withdrawal, suggesting that some banks are either too big to fail or too large to be disciplined adequately. Finally, as the banking sector as a whole violates more standards, the CBR is more lenient towards withdrawing individual bank licenses. This corroborates the "too many to fail" hypothesis developed in Mitchell (1998).

The coefficients in the lower part of Table 2.5 shed light on the regulatory enforcement of prudential bank standards by the CBR. A majority of the compliance measures show no significance, suggesting regulatory forbearance in the CBR's delicensing policy. The non-reported scores dummy variable is however always significantly positively related to license withdrawal. This could mean that the CBR interprets a bank's failure to report its scores on some regulatory standards as a signal of non-compliance. Alternatively, if non-reporting is highly correlated with poor performance on the compliance measures, it could indicate that a bank that expects to lose its license in any case, does not bother to report its scores on some bank standards any longer. The negative correlation between the number and severity of breaches of the large-credit-risks-to-capital ratio (N7) and the households' deposits-to-capital ratio (N11) shown in Table 2.3 suggests the former interpretation. For a majority of standards however, the number and severity of breaches is positively correlated with non-reporting, which suggests that banks with more frequent and large breaches of bank standards more often fail to report, lending support to the latter thesis. Thus, both hypotheses seem to be valid. If banks breach standards N7 and N11, non-reporting leads to a punishment by the CBR, while banks that already expect withdrawal because of frequent and severe violations of the other standards, may not bother to report their scores any more.

We do find consistent indications of enforcement for the quick liquidity ratio (N2), the current liquidity ratio (N3) and the general liquidity ratio (N5). Indeed, if these variables show up significantly, it is always with a positive sign, indicating that a greater number of breaches and more severe breaches of these bank standards relate to a higher probability of license withdrawal. The broad enforcement of liquidity

standards is not necessarily good news. It implies that the CBR may be running behind the facts, by mainly de-licensing already illiquid banks (and possibly illiquid because of asset stripping in the face of expected de-licensing), at a point where failure has become convenient to its owners. Moreover, the CBR is more likely to close banks breaching on quick liquidity, rather than those breaching on long liquidity. This indicates that if a bank fails on long-term or general liquidity the CBR allows it to "gamble for resurrection" to avoid losses on selling illiquid assets (Kane, 1989). Violations of the pocket-bank-related standards (N9.1 and N10.1) also yield a disciplinary reaction from the CBR, which indicates that the CBR is not more lenient towards banks that have strong political clout.

While we find some enforcement of the capital adequacy standard (N1), the coefficient of the ratio of large credit risks to capital (N7) only shows weak indications of enforcement and the households' deposits-to-capital ratio (N11) is not enforced at all. On the contrary, the sign for N11 is consistently negative. This corroborates our hypothesis that the enforcement of this standard would affect precisely those banks that are most active on the deposit market, and runs counter to the CBR objective of securing and restoring depositor trust and systemic stability. A conflict between two inconsistent CBR objectives is sharply revealed here.

The results in Table 2.5 suggest that the CBR's licensing policy is guided by other, more tacit, objectives than compliance with bank standards alone. To test the second hypothesis, that these tacit objectives conflict with the enforcement of prudential regulations, we interact them with the regulatory breach variables. We expect that if the tacit objectives defined in our study conflict with regulatory enforcement, observed enforcement will diminish with the degree of bank concentration, bank size and aggregate non-compliance with prudential regulation. To ease interpretation, we define a composite liquidity and capital standard that we subsequently interact with the tacit objectives. Definitions and summary statistics of these variables are included in Tables 2.1 to 2.3.

Table 2.6 shows estimation results for the model defined in (2.2) that reveal the conflicts between the regulatory enforcement and tacit stability objectives of the CBR. As the coefficient estimates of the economic variables and tacit objectives remain largely unaffected when using the composite standards, we omitted these to ease the exposition of results. Since the results for alternative values of the discount factor do not differ significantly, we only show the results for a discount parameter of $\alpha = 0.5$.

The results indicate that the CBR enforces both liquidity and – to some extent – capital requirements. However, depending on how compliance is measured, capital

requirements are enforced only when assuming that the CBR investigates the number of times a bank has breached (columns I to IV). The results in columns V to IX however suggest that even though breaches of capital requirements are enforced, the severity with which these are breached does not matter.[18]

We further find that liquidity standards are less enforced in regions with low regional competition, while capital requirements are less enforced for sizeable banks (columns II and III). Similarly, while severe breaches of the liquidity requirements are punished, a bank's failure probability is reduced when it is operating in a poorly banked region (VI).

The evidence for potential biases in regulatory enforcement coming from the "too many to fail" objective is mixed. On the one hand, the banking sector's aggregate number of breaches does not systematically reduce the punishment for frequent breaches of liquidity and capital standards (IV). This suggests that although individual bank failure diminishes when too many banks can fail, it does not skew the CBR's de-licensing behavior towards forbearance. On the other, more severe violations of both liquidity and capital requirements are less sanctioned when there are too many banks to fail (IX).

2.5 Robustness

We constructed a third compliance variable that captures the total volume of breaches, rather than the number of breaches or their average severity. This measure should be interpreted as the one-sided total distance over time for a given bank between any bank standard n and the bank's actual score on the standard:

$$vbreach_{n,i,t} = nbreach_{n,i,t} * sbreach_{n,i,t}.$$

Again, we discount the past by imposing exponentially decreasing weights to past volumes of breaches and get:

$$dvbreach_{n,i,t} = \sum_{z=k}^{t} \varpi_t(vbreach_z).$$

This measure is theoretically the most appealing way of assessing compliance with prudential standards. Imposing that the CBR takes this measure into account

[18] When assuming that the CBR has a higher discount factor ($\alpha = 0.7$), we observe some punishment in terms of license withdrawal of severe violations of the capital regulation. These results are available upon request.

only corroborates the enforcement of liquidity standards and the capital adequacy standard (N1), but in general shows even less enforcement compared to the *dnbreach* and *dsbreach* variables.

In stead of gauging the *interbank liabilities to total liabilities* ratio, the CBR may want to protect only money-center banks to enhance the stability of the interbank market. If large banks at the heart of the interbank system fail, the entire banking system could collapse.[19] It is therefore likely that the CBR will want to avoid this in order to preserve systemic stability.[20] To test this hypothesis, we included the bank's *market share in total interbank liabilities*. Similarly, we included the bank-specific *market share in total government securities* to investigate whether the CBR is mainly captured by banks that hold a large absolute amount of government securities (mainly bonds). If this were the case, the government may be less willing to liquidate its largest financiers than less influential small banks. These hypotheses could not be corroborated.

2.6 Concluding remarks

In this chapter, we focus on the potential conflict between the central bank objectives of individual bank stability (usually assured through the enforcement of prudential bank standards) and systemic stability and the regulatory forbearance that may follow from it. We achieve this by conducting an empirical study of the licensing policy of the Central Bank of Russia (CBR) during the period 1999–2002, a period with consistent regulatory policy. Russia provides an intriguing opportunity for analyzing potential conflicts in the objective function of a central bank. The CBR is a very young central bank that combines a broad swathe of authorities and functions. Equally important, the period of study involves many banks and many bank failures, allowing us to study empirically how well the CBR enforced its own bank standards.

Our analysis reveals strong indications of this conflict. First, controlling for economic reasons of bank failure (loan quality, profitability, liquidity, efficiency, market power), we find that there are a number of biases in the CBR's licensing policy. Specifically, banks in poorly banked regions, banks that are too big to be disciplined adequately, and banks active on the interbank market seem to enjoy a certain degree of protection against license withdrawal by the CBR. Further, when too many

[19] See, for example, Wall and Peterson (1990) on the FDIC bail-out of Continental Illinois and Kapstein (1994) and Davis (1992) on the failure of Herstatt Bank.

[20] Freixas et al. (2000) show that it may be too costly to close down money-center banks, because it might trigger the liquidation of all other banks. See also Rochet and Tirole (1996) on this point.

banks can fail at the same time, individual license withdrawal probability is also reduced. These results suggest that CBR de-licensing activity is not only driven by enforcement of its own prudential bank standards but also by more tacit objectives related to the systemic stability of the banking system.

Second, we can neither reject capital adequacy and liquidity standards are enforced, nor that tacit objectives induce regulatory forbearance by the CBR. The finding that some bank standards are enforced is encouraging. On the other hand, the fact that it are mostly liquidity regulations that are enforced is not particularly comforting. It suggests that the CBR mainly de-licenses banks that are already illiquid instead of anticipating future trouble. Moreover there are strong indications that the presence of tacit objectives in the CBR's objective function leads to regulatory forbearance. The results indicate that liquidity standards are less enforced in regions with low regional competition, capital requirements are less enforced for sizeable banks and severe breaches of liquidity requirements are forborne when the bank is operating in a poorly banked region. This sharply reveals how the conflict between individual bank stability and systemic stability affects license withdrawal decisions. The CBR was also quite reticent about withdrawing bank licenses from banks that repeatedly and severely violated the households' deposits-to-capital ratio, supposedly because this specific bank standard carries an inherent conflict between the objective of individual bank stability (as enshrined in the bank standard) and the tacit CBR objective of securing depositor trust and systemic stability, which would be endangered by withdrawing licenses from the most active deposit banks.

Hence, we find that tacit objectives in the CBR objective function are inconsistent with the rule-based enforcement of bank standards, leading to regulatory forbearance. This indicates that the conflict between individual bank stability and systemic bank stability in a central bank's objective function may be a fundamental problem that may affect the prudential control of the banking system in ways that are not fully understood. Further theoretical work is needed to disentangle under which conditions this conflict may skew supervisory decisions and what the welfare implications are. It would be of interest to analyze whether this conflict can also be detected in more stable banking markets and in banking markets where the supervisory authority is not housed within the central bank..

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2.A Data sources

The bank data were supplied by two well-established Russian information agencies, Interfaks and Mobile, and by the CBR. Interfaks supplied a database with quarterly bank data on balances, profit and loss accounts and quarter-specific, bank-specific scores on a battery of regulatory standards for all Russian banks from 1999 to 2002. Mobile provided monthly bank balances and profit and loss accounts and a more limited list of quarter-specific, bank-specific scores on regulatory standards but for a longer period, from mid-1995 (although initially not for all banks) up to 2002. The two databases complement each other as they offer different classifications and a different degree of detail of the same data. The financial data employed in the analysis includes 1,509 banks, i.e. almost all operational banks in the period under study, covering 16 quarters from 1999:Q1 to 2002:Q4. These financial data were linked to bank licensing data. From the freely available information on the CBR's website, we reconstructed the complete register of bank licenses. The dataset contains bank license data of all banks from 1988 up to now. For every bank that ever existed in Russia, we know when it received a license, the specific type of license it received, when it lost its license (if ever), and the official reason for losing it. We also know from the CBR instructions and regulations how the supervisory standards evolved in the period under study. Thus, for each bank in every period we know how the bank should score on a specific standard and how it actually does, which allows the identification of breaches of regulatory standards. For a highly detailed overview on all data issues, please consult Karas and Schoors (2005).

2.B Prudential regulations of the CBR

The regulation that governs our period of study came into force on April 1, 1996 and draws on CBR Instruction No. 1 of January 30, 1996, "On the Procedure for Regulating the Activities of Credit Organisations."[21] This regulation is issued in accordance with the Federal Law on the Central Bank of the Russian Federation (Bank of Russia) and established a set of new prudential bank standards, taking into account international banking practices. For Russian standards, the new bank standards were rather strict and the CBR gave banks time to adjust to the new conditions. Yet the enormous peak of license withdrawals in May 1996 (see figure 2.1) demonstrates that the adjustment process was rather abrupt. We concentrate on the bank standards (*normas* as the CBR refers to them) imposed by the CBR. In addition to minimal capital requirements, the CBR has instituted regulations on capital adequacy requirements (N1), liquidity requirements (N2, N3, N4, N5), credit risk requirements (N7, N9, N10, N11, N12, N13), and a host of other less important regulations and voluntary guidelines.

Capital adequacy ratio (N1) On April 1, 1996, the bank equity capital adequacy ratio (N1) was defined as the ratio of the bank's equity capital to the overall risk-weighted assets minus the sum of the reserves created for depreciation of securities and possible losses. Since February 1998, the minimum level of N1 is set depending on the amount of the bank's equity capital:

5 million euro	*1 to 5 million euro*	*Less than 1 million euro*
July, 1996 – 5%		
February, 1997 – 6 %		
February, 1998 – 7 %	February, 1998 – 7 %	February, 1998 – 7 %
February, 1999 – 8 %	February, 1999 – 9 %	
January, 2000 – 10 %	January, 2000 – 11 %	

Quick liquidity ratio (N2) The quick liquidity ratio (N2) is defined as the ratio of the sum of the bank's highly liquid assets to the sum of the bank's liabilities on demand accounts. The minimum value of the N2 ratio was set at 10% on July 1, 1996 and at 20% on February 1, 1997.

[21] For more detailed information on prudential regulations, consult the references for banking legislation listed in appendix 2.C.

Current liquidity ratio (N3) The current liquidity ratio (N3) is defined as the ratio of the sum of the bank's liquid assets to the sum of the bank's liabilities on demand accounts and accounts up to 30 days. The minimum value of the current liquidity ratio was set at no less than:

20% of total assets as of July 1, 1996;
30% of total assets as of February 1, 1997;
50% of total assets as of February 1, 1998;
70% of total assets as of February 1, 1999.

Long-term liquidity ratio (N4) The long-term liquidity ratio (N4) is defined as the ratio of the entire long-term debt to the bank, including guarantees and sureties with a maturity of more than one year, to the bank's equity capital and liabilities on deposit accounts, credits received and other debt liabilities with maturities exceeding one year. The long-term liquidity ratio should not exceed 120%.

General liquidity ratio (N5) The general liquidity ratio (N5) is defined as the percentage of liquid assets in the bank's aggregate assets. The minimum value of the N5 ratio has been set at:

10% of total assets as of July 1, 1996;
20% of total assets as of February 1, 1997.

Large credit risk (N7) Large credit risk (N7) is defined as a percentage of the total amount of large credit risks in the bank's equity capital. A large credit is the total sum of the bank's risk-weighted claims to one borrower (or a group of related borrowers) on credits, taking into account 50% of the sum of off-balance claims – guarantees and sureties held by the bank with regard to one borrower (or a group of related borrowers), exceeding 5% of the bank's equity capital. Note that the decision to extend a large credit or loan must be made by the board of the bank or its credit committee, taking into account the opinion of the bank's credit department. Large credit risk was not to exceed 12 times the bank's capital in 1996, 10 times in 1997 and 8 times in 1998.

Risk per borrower-shareholder (N9.1) The risk per borrower-shareholder (N9.1) is defined as the amount of credits, guarantees and sureties issued by the bank to one corporate or individual shareholder or to a group of related corporate or individual shareholders of the bank divided by equity capital. Related shareholders are

corporate and individual shareholders connected with one another economically and legally (e.g. having common property and/or mutual guarantees and/or obligations, and/or controlling each other's property, as well as an individual concurrently holding several senior executive positions), such that the financial problems of one of the shareholders cause or may cause financial problems for the other shareholder(s). Since January 1, 1998, N9.1 should not exceed 50% of the bank's equity capital.

Credit to insiders (N10.1) The aggregate amount of credits and loans extended to insiders (N10.1) may not exceed 3% of the bank's equity capital. Insiders comprise the following individuals: shareholders who own more than 5% of shares, directors (presidents, chairmen, and their deputies), Board members, members of the credit committee, senior executives of subsidiary and parent structures, and other persons who may influence the decision to issue credit, as well as relatives of insiders, former insiders and other persons participating in outside structures in which insiders also participate.

Coverage of household deposits by capital (N11) N11 is defined as the ratio of the sum of household deposits to equity capital. Since July 1996, household deposits should be 100% covered by equity capital.

Coverage of the bank's investments in shares by capital (N12) The bank's own investments in shares of other legal entities has been limited to:

45% of equity capital as of July 1, 1996;
35% of equity capital as of October 1, 1996;
25% of equity capital as of January 1, 1997.

Bank's own promissory note liability risk ratio (N13) N13 is defined as the percentage of the bills of exchange and bills of acceptance issued by the bank plus 50% of the bank's off-balance liabilities arising from the endorsement of bills, sureties and bill brokerage in the bank's equity capital. The maximum levels have been set at:

200% of the balance as of October 1, 1996;
100% of the balance as of March 1, 1997.

2.C References for banking legislation

Bank of Russia Instruction No. 1 of May 5, 1991, "On the Procedure of Regulating the Activities of Credit Organisations."

Bank of Russia Instruction No. 1 of January 30, 1996, "On the Procedure of Regulating the Activities of Credit Organisations."

Bank of Russia Instruction No. 59 of March 31, 1997, "On Imposing Sanctions to Credit Organizations for Infringement of Prudential Norms."

Bank of Russia Instruction No. 1 of October 1, 1997, "On the Procedure of Regulating the Activities of Credit Organisations."

Bank of Russia Letter No. 121-T of August 20, 2003 "About Actions Which Should Be Taken When Facts of Breaching Norms N8, N9, N11, N11.1 and N14 Are Revealed."

Bank of Russia Letter No. 124-T of August 21, 2003 "On the Bank's Own Promissory Note Liability Risk Ratio N13."

Civil Code of the Russian Federation, part I.

Federal Law of December 2, 1990, No. 395-1, "On Banks and Banking Activity."

2.D Tables

TABLE 2.1

Description of Variables and Data Sources

Deflator[1]	Average monthly inflation (%).
Moscow Dummy	A dummy variable that equals one if the bank is located in Moscow, zero otherwise.
Economic Variables	
Return on assets[2]	The returns-to-assets ratio of bank *i* in quarter *t* (%).
Cost/assets[2]	The ratio of personnel costs to two month average of total assets of bank *i* in quarter *t* (%).
Interbank liabilities/liabilities[2]	Interbank liabilities to total liabilities of bank *i* in quarter *t* (%).
Government claims/assets[2]	The ratio of government claims to assets of bank *i* in quarter *t* (%).
Regional market share (assets)[2]	The regional[4] market share in assets, calculated as the ratio of bank *i*'s individual assets to the sum of bank assets for region j in quarter *t* (between 0 and 100).
Non performing loans/loans[2]	The ratio of non-performing loans to total loans of bank *i* in quarter *t* (%).
Reserves/assets[2]	The ratio of total reserves (including excess reserves) to total assets of bank *i* in quarter *t* (%).
Tacit CBR Objectives	
Regional Herfindahl (assets)[2]	The regional[4] Herfindahl index, calculated as the sum of squared regional market shares for each region *j* in quarter *t* (between 0 and 10,000).
Size (log assets)[2]	The log of assets of bank *i* in quarter *t*.
Aggregate number of breaches	The banking sector's aggregate number of breaches of all standards in quarter *t*.
Compliance with Regulatory Standards[3]	
Non-reported scores	A dummy variable that equals one when information on at least one of the regulatory standards 7, 9.1, 10.1, 11, 12 or 13 is not reported, zero otherwise. The scores on all other standards are always reported.
$breach_{n,i,t}$	A dummy variable that equals one whenever bank *i* violates regulation n in quarter *t*, zero otherwise.
$nbreach_{n,i,t}$	The sum of actual breaches - relative to the maximum potential - registered by bank *i* from t_0^{PR} up till *t*, corrected for 'late entry' (see Figure 2).
$dnbreach_{n,i,t}$	An exponentially smoothed version of *nbreach* with varying weights for α.
$sbreach_{n,i,t}$	The average severity of breaches registered by bank *i* from t_0^{PR} up till *t*. Severity is defined as the relative deviation from the prudential standard whenever breach equals one.
$dsbreach_{n,i,t}$	An exponentially smoothed version of *sbreach* with varying weights for α.
Composite Liquidity Standard$_{n,i,t}$	The sum of *dnbreach* or the average of *dsbreach* for regulatory standards 2, 3, 4 and 5.
Composite Capital Standard$_{n,i,t}$	The sum of *dnbreach* or the average of *dsbreach* for regulatory standards 1, 7, 9.1, 10.1, 11, 12 and 13.

[1]Source: Russian Economic Trends. [2]Source: Own calculations based on Interfaks. [3]Source: Own calculations based on regulatory standards published by the CBR (see appendix B) and bank-specific scores on regulatory standards acquired from Interfaks and Mobile. [4]Note: We use 80 regions for the calculation of regional market shares.

TABLE 2.2a

Summary Statistics: Economic Variables - Tacit CBR Objectives

	Obs.	Mean	Std. Dev.	Min.	Max.	Freq.
Deflator	20136	1.96	1.74	0.46	8.02	
Moscow Dummy	20136	0.49	0.50	0	1	
Economic Variables						
Return on assets	20030	0.57	8.16	-149.61	479.61	
Cost/assets	20103	1.29	2.15	0	76.60	
Interbank liabilities/liabilities	20097	10.63	19.12	0	100.00	0.47%
Government securities/assets	20136	1.75	6.15	0	92.4	
Regional market share (assets)	20136	5.48	13.38	0.0000173	100	0.15%
Non performing loans/loans	19699	5.09	13.09	0	100	0.56%
Reserves/assets	20136	17.62	15.52	0	100	0.14%
Tacit CBR Objectives						
Regional Herfindahl (assets)	20136	1990	1380	847	9830	
Size (log assets)	20136	4.90	1.93	-1.94	11.75	
Aggregate number of breaches	20136	0.33	0.15	0	0.68	

Source: Own calculations based on Interfaks, Russian Economic Trends and CBR. A detailed description of the variables and data sources is provided in Table 2.1.
Note: Frequency is defined for the variables that reach a maximum of 100. It indicates the percentage of observations between 95 and 100.

TABLE 2.2b

Summary Statistics: Compliance with Regulatory Standards

	Obs.	Mean	Std. Dev.	Min.	Max.
Non-reported scores	20136	0.07	0.25	0	1
		Number of Breaches			
Capital adequacy ratio (N1)	19799	0.52	1.66	0	21
Quick liquidity ratio (N2)	19789	0.72	1.87	0	16
Current liquidity ratio (N3)	19790	1.04	2.12	0	17
Long-term liquidity ratio (N4)	19788	0.12	0.60	0	8
General liquidity ratio (N5)	19796	1.09	2.47	0	20
Large-risks-to-capital ratio (N7)	19789	0.07	0.40	0	6
Owner-related-credit-risks-to-capital ratio (N9.1)	19787	0.19	0.64	0	6
Insider-related-credit-risks-to-capital ratio (N10.1)	19788	0.16	0.61	0	9
Individuals' deposits-to-capital ratio (N11)	19787	1.52	3.37	0	22
Investment-to-shares-to-capital ratio (N12)	19787	0.16	0.60	0	8
Issued-promissory-notes-to-capital ratio (N13)	19788	0.35	1.15	0	16
Composite Liquidity Standard	19796	2.97	6.15	0	54
Composite Capital Standard	19799	2.97	5.01	0	42
		Severity of Breaches			
Capital adequacy ratio (N1)	19784	0.18	2.02	0	59.12
Quick liquidity ratio (N2)	19769	0.15	0.81	0	13.98
Current liquidity ratio (N3)	19787	0.14	0.96	0	26.38
Long-term liquidity ratio (N4)	19735	0.01	0.09	0	1.82
General liquidity ratio (N5)	19777	0.05	0.16	0	2.70
Large-risks-to-capital ratio (N7)	19697	0.00	0.02	0	0.50
Owner-related-credit-risks-to-capital ratio (N9.1)	19738	0.03	0.18	0	4.18
Insider-related-credit-risks-to-capital ratio (N10.1)	19708	0.05	0.41	0	16.44
Individuals' deposits-to-capital ratio (N11)	19758	0.13	0.56	0	8.67
Investment-to-shares-to-capital ratio (N12)	19769	0.03	0.20	0	4.35
Issued-promissory-notes-to-capital ratio (N13)	19748	0.05	0.29	0	5.66
Composite Liquidity Standard	19796	0.09	0.43	0	9.36
Composite Capital Standard	19799	0.07	0.33	0	8.45

Source: Own calculations based on Interfaks, Mobile and CBR.
Note: The calculations of the compliance variables are based on the period 1997:Q2 - 2002:Q4. The estimation sample is restricted to the period 1999:Q1 - 2002:Q4. More detailed information on variable construction is provided in Table 2.1. Detailed information on regulatory standards is provided in appendix B.

TABLE 2.2b

Summary Statistics: Compliance with Regulatory Standards

	Obs.	Mean	Std. Dev.	Min.	Max.
		Discounted Number of Breaches (α=0.5)			
Capital adequacy ratio (N1)	19799	0.36	1.79	0	23.00
Quick liquidity ratio (N2)	19789	0.51	1.97	0	23.00
Current liquidity ratio (N3)	19790	0.67	2.23	0	23.00
Long-term liquidity ratio (N4)	19788	0.07	0.62	0	15.79
General liquidity ratio (N5)	19796	0.60	2.26	0	23.00
Large-risks-to-capital ratio (N7)	19789	0.08	0.76	0	20.43
Owner-related-credit-risks-to-capital ratio (N9.1)	19787	0.07	0.49	0	10.50
Insider-related-credit-risks-to-capital ratio (N10.1)	19788	0.09	0.73	0	20.67
Individuals' deposits-to-capital ratio (N11)	19787	1.98	5.09	0	23.00
Investment-to-shares-to-capital ratio (N12)	19787	0.05	0.54	0	18.93
Issued-promissory-notes-to-capital ratio (N13)	19788	0.31	1.69	0	23.00
Composite Liquidity Standard	19796	1.85	5.80	0	68.95
Composite Capital Standard	19799	2.95	6.48	0	73.50
		Discounted Severity of Breaches (α=0.5)			
Capital adequacy ratio (N1)	19798	0.04	0.54	0	40.49
Quick liquidity ratio (N2)	19774	0.09	0.69	0	19.32
Current liquidity ratio (N3)	19790	0.04	0.25	0	11.84
Long-term liquidity ratio (N4)	19748	0.00	0.04	0	1.33
General liquidity ratio (N5)	19784	0.03	0.15	0	2.50
Large-risks-to-capital ratio (N7)	19699	0.00	0.02	0	0.41
Owner-related-credit-risks-to-capital ratio (N9.1)	19756	0.01	0.08	0	2.44
Insider-related-credit-risks-to-capital ratio (N10.1)	19753	0.03	0.40	0	13.35
Individuals' deposits-to-capital ratio (N11)	19752	0.11	0.42	0	6.32
Investment-to-shares-to-capital ratio (N12)	19770	0.01	0.07	0	2.34
Issued-promissory-notes-to-capital ratio (N13)	19747	0.03	0.22	0	4.79
Composite Liquidity Standard	19796	0.04	0.23	0	5.71
Composite Capital Standard	19799	0.03	0.13	0	5.78

Source: Own calculations based on Interfaks, Mobile and CBR.
Note: The calculations of the compliance variables are based on the period 1997:Q2 - 2002:Q4. The estimation sample is restricted to the period 1999:Q1 - 2002:Q4. More detailed information on variable construction is provided in Table 2.1. Detailed information on regulatory standards is provided in appendix B.

TABLE 2.3a

Correlation Matrix of Economic Variables - Tacit CBR Objectives - Compliance variables (*dnbreach*, α=0.5)

	Deflator	Moscow Dummy	Return on assets	Cost/ assets	Interbank liabilities/ liabilities	Government securities/ assets	Regional market share (assets)
Deflator	1						
Moscow Dummy	0.0017	1					
Return on assets	-0.0003	-0.0148*	1				
Cost/assets	0.3014*	-0.2719*	-0.0194*	1			
Interbank liabilities/liabilities	-0.0285*	0.2497*	-0.0225*	-0.1438*	1		
Government securities/assets	-0.0042	-0.1855*	0.0272*	0.0290*	-0.0773*	1	
Regional market share (assets)	-0.0208*	-0.3919*	0.0098	0.0425*	-0.0798*	0.1145*	1
Non performing loans/loans	0.1160*	-0.1562*	-0.0280*	0.2102*	0.0055	0.009	0.0186*
Reserves/assets	-0.0571*	-0.1118*	0.0586*	0.0703*	-0.2996*	0.0968*	0.0064
Regional Herfindahl (assets)	-0.0052	-0.5965*	0.0104	0.2346*	-0.1747*	0.1196*	0.5325*
Size (log assets)	-0.1621*	0.2283*	-0.008	-0.3489*	0.3171*	0.0724*	0.1567*
Aggregate number of breaches	0.6534*	-0.0177*	0.0000	0.1736*	-0.0659*	0.0215*	-0.0018
Non-reported scores	0.1031*	0.0102	-0.0113	-0.0480*	-0.0201*	0.0101	-0.0085
N1	0.0397*	-0.0204*	-0.0096	0.0229*	0.1141*	0.0528*	0.0330*
N2	0.0900*	-0.0372*	-0.0237*	0.0562*	0.0821*	0.0526*	0.0174*
N3	0.0527*	-0.0883*	-0.0256*	0.0681*	0.0582*	0.0664*	0.0575*
N4	0.0380*	-0.0078	-0.0162*	0.0009	0.0495*	-0.0109	0.0124
N5	0.0624*	-0.1130*	-0.0238*	0.1094*	0.0440*	0.0061	0.0335*
N7	-0.0286*	-0.0212*	-0.013	-0.0210*	0.0428*	0.0038	0.0187*
N9.1	0.0864*	-0.0682*	-0.0077	0.0496*	0.0037	0.0380*	0.0210*
N10.1	0.0278*	-0.0351*	-0.0202*	0.0137	0.0157*	0.0231*	0.0038
N11	-0.0952*	-0.1946*	-0.0052	0.0138	-0.0781*	0.0620*	0.2240*
N12	0.0193*	-0.0300*	-0.0092	0.0042	0.0314*	0.0295*	0.0144*
N13	-0.01	-0.0647*	-0.0065	-0.0304*	-0.0123	0.0106	0.0185*
Composite Liquidity Standard	0.0793*	-0.0915*	-0.0289*	0.0880*	0.0727*	0.0446*	0.0424*
Composite Capital Standard	-0.0585*	-0.1895*	-0.0135	0.0125	-0.0234*	0.0745*	0.1952*

	Non performing loans/loans	Reserves/ assets	Regional Herfindahl (assets)	Size (log assets)	Aggregate number of breaches	Non-reported scores	*dnbreach* N1
Non performing loans/loans	1						
Reserves/assets	-0.0513*	1					
Regional Herfindahl (assets)	0.1295*	0.0959*	1				
Size (log assets)	-0.2226*	-0.2162*	-0.2157*	1			
Aggregate number of breaches	0.1291*	-0.0438*	0.0094	-0.2031*	1		
Non-reported scores	0.0878*	-0.0545*	-0.0078	-0.1094*	0.1691*	1	
N1	0.2808*	-0.1105*	-0.0029	0.0995*	0.0783*	0.0422*	1
N2	0.3696*	-0.1736*	0.0279*	-0.0372*	0.1370*	0.0862*	0.5175*
N3	0.3696*	-0.1110*	0.0695*	-0.0381*	0.1135*	0.0554*	0.5267*
N4	0.1810*	-0.0592*	-0.0087	0.0332*	0.0778*	0.0368*	0.2218*
N5	0.4457*	-0.1579*	0.0793*	-0.1380*	0.0921*	0.0486*	0.4426*

N7	0.0549*	-0.0451*	-0.0177*	0.0790*	0.0140*	-0.0247*	0.4021*
N9.1	0.1038*	-0.0261*	0.0420*	-0.0350*	0.1208*	0.0614*	0.0925*
N10.1	0.0647*	-0.0133	0.0326*	-0.0003	0.0549*	0.0199*	0.1101*
N11	-0.0527*	-0.0384*	0.1088*	0.2376*	-0.1461*	-0.0646*	0.0263*
N12	0.0752*	-0.0368*	0.0032	0.0156*	0.0336*	0.0127	0.1254*
N13	0.0185*	-0.0375*	-0.0494*	0.1100*	-0.0092	-0.0124	0.1615*
Composite Liquidity Standard	0.4606*	-0.1695*	0.0662*	-0.0775*	0.1345*	0.0731*	0.5745*
Composite Capital Standard	0.0688*	-0.0823*	0.0768*	0.2508*	-0.0754*	-0.0379*	0.4159*

	dnbreach N2	*dnbreach* N3	*dnbreach* N4	*dnbreach* N5	*dnbreach* N7	*dnbreach* N9.1	*dnbreach* N10.1
N2	1						
N3	0.6514*	1					
N4	0.1894*	0.2096*	1				
N5	0.6041*	0.6554*	0.1912*	1			
N7	0.0927*	0.1685*	0.2478*	0.1167*	1		
N9.1	0.1094*	0.1138*	0.1193*	0.1230*	0.0900*	1	
N10.1	0.0851*	0.1423*	0.2089*	0.0500*	0.1221*	0.0767*	1
N11	-0.0351*	0.0001	0.0364*	-0.0515*	0.0592*	0.0186*	0.0500*
N12	0.1215*	0.1172*	0.0935*	0.1039*	0.1042*	0.0909*	0.0607*
N13	0.0512*	0.1066*	0.0908*	0.0489*	0.2843*	0.0399*	0.0829*
Composite Liquidity Standard	0.8460*	0.8837*	0.3262*	0.8672*	0.1682*	0.1416*	0.1253*
Composite Capital Standard	0.1674*	0.2274*	0.1829*	0.1318*	0.3787*	0.1525*	0.2286*

	dnbreach N11	*dnbreach* N12	*dnbreach* N13	Composite Liquidity Standard	Composite Capital Standard
N11	1				
N12	0.0421*	1			
N13	0.1303*	0.1671*	1		
Composite Liquidity Standard	-0.0281*	0.1368*	0.0871*	1	
Composite Capital Standard	0.8442*	0.2201*	0.4678*	0.2152*	1

Source: Own calculations based on Interfaks, RET and CBR. More detailed information on variable construction is provided in Table 2.1.

TABLE 2.3b

Correlation Matrix of Economic Variables - Tacit CBR Objectives - Compliance variables (*dsbreach*, α=0.5)

	Deflator	Moscow Dummy	Return on assets	Cost/ assets	Interbank liabilities/ liabilities	Government securities/ assets	Regional market share (assets)
Deflator	1						
Moscow Dummy	0.0017	1					
Return on assets	-0.0003	-0.0148*	1				
Cost/assets	0.3014*	-0.2719*	-0.0194*	1			
Interbank liabilities/liabilities	-0.0285*	0.2497*	-0.0225*	-0.1438*	1		
Government securities/assets	-0.0042	-0.1855*	0.0272*	0.0290*	-0.0773*	1	
Regional market share (assets)	-0.0208*	-0.3919*	0.0098	0.0425*	-0.0798*	0.1145*	1
Non performing loans/loans	0.1160*	-0.1562*	-0.0280*	0.2102*	0.0055	0.009	0.0186*
Reserves/assets	-0.0571*	-0.1118*	0.0586*	0.0703*	-0.2996*	0.0968*	0.0064
Regional Herfindahl (assets)	-0.0052	-0.5965*	0.0104	0.2346*	-0.1747*	0.1196*	0.5325*
Size (log assets)	-0.1621*	0.2283*	-0.008	-0.3489*	0.3171*	0.0724*	0.1567*
Aggregate number of breaches	0.6534*	-0.0177*	0	0.1736*	-0.0659*	0.0215*	-0.0018
Non-reported scores	0.1031*	0.0102	-0.0113	-0.0480*	-0.0201*	0.0101	-0.0085
N1	0.0690*	-0.0248*	-0.0098	0.0702*	0.0526*	0.0061	0.0149*
N2	0.1467*	-0.0380*	-0.0286*	0.0793*	0.0058	-0.001	0.0302*
N3	0.1226*	-0.0396*	-0.0231*	0.1057*	0.0260*	0.0078	0.0198*
N4	0.0430*	0.0006	0.0004	-0.0001	0.0705*	-0.0054	0.007
N5	0.1403*	-0.0803*	-0.0506*	0.1192*	0.0449*	-0.0021	0.0313*
N7	-0.0237*	-0.0218*	-0.0045	-0.0160*	0.0494*	0.0035	0.0227*
N9.1	0.0886*	-0.0424*	-0.0142*	0.0499*	0.0077	0.0153*	0.0141*
N10.1	0.0262*	-0.0267*	-0.0043	0.0139	0.0259*	0.0242*	0.0056
N11	-0.011	-0.1211*	-0.0147*	0.0186*	-0.0385*	0.0178*	0.1385*
N12	0.0330*	-0.0234*	0.0004	0.0021	0.0380*	0.0115	-0.0005
N13	0.0185*	-0.0293*	-0.0043	-0.0249*	-0.0007	0.0018	-0.003
Composite Liquidity Standard	0.1630*	-0.0507*	-0.0346*	0.1040*	0.0214*	0.0007	0.0325*
Composite Capital Standard	0.0610*	-0.0945*	-0.0166*	0.0543*	0.0287*	0.0250*	0.0754*

	Non performing loans/loans	Reserves/ assets	Regional Herfindahl (assets)	Size (log assets)	Aggregate number of breaches	Non-reported scores	*dsbreach* N1
Non performing loans/loans	1						
Reserves/assets	-0.0513*	1					
Regional Herfindahl (assets)	0.1295*	0.0959*	1				
Size (log assets)	-0.2226*	-0.2162*	-0.2157*	1			
Aggregate number of breaches	0.1291*	-0.0438*	0.0094	-0.2031*	1		
Non-reported scores	0.0878*	-0.0545*	-0.0078	-0.1094*	0.1691*	1	
N1	0.2003*	-0.0408*	0.0332*	-0.0365*	0.0766*	0.0334*	1
N2	0.2345*	-0.0918*	0.0257*	-0.0407*	0.1577*	0.0900*	0.2560*
N3	0.3142*	-0.0977*	0.0291*	-0.0519*	0.1441*	0.0903*	0.2658*
N4	0.1247*	-0.0451*	-0.0119	0.0309*	0.0711*	0.0417*	0.0441*

N5	0.4581*	-0.1529*	0.0523*	-0.1176*	0.1654*	0.0940*	0.2995*
N7	0.0690*	-0.0392*	-0.0044	0.0630*	0.0051	-0.0248*	0.0453*
N9.1	0.1099*	-0.0354*	0.0311*	-0.0377*	0.1204*	0.0603*	0.0238*
N10.1	0.0510*	-0.0139	0.0364*	-0.0331*	0.0500*	0.0177*	0.0228*
N11	0.0348*	-0.0448*	0.0386*	0.1613*	-0.0104	-0.0047	0.0291*
N12	0.0972*	-0.0411*	0.0076	-0.0096	0.0512*	0.0264*	0.0486*
N13	0.0577*	-0.0377*	-0.0342*	0.0578*	0.0533*	0.0117	0.0277*
Composite Liquidity Standard	0.3297*	-0.1185*	0.0341*	-0.0601*	0.1820*	0.1055*	0.2966*
Composite Capital Standard	0.1875*	-0.0664*	0.0480*	0.0491*	0.0891*	0.0342*	0.6243*

	dsbreach N2	*dsbreach* N3	*dsbreach* N4	*dsbreach* N5	*dsbreach* N7	*dsbreach* N9.1	*dsbreach* N10.1
N2	1						
N3	0.7048*	1					
N4	0.1091*	0.1162*	1				
N5	0.5406*	0.7631*	0.1614*	1			
N7	0.0340*	0.0548*	0.1644*	0.0789*	1		
N9.1	0.1232*	0.0806*	0.0472*	0.1479*	0.0270*	1	
N10.1	0.0592*	0.0494*	0.1646*	0.0463*	0.0390*	0.0998*	1
N11	0.0858*	0.0569*	0.0900*	0.0794*	0.0918*	0.1781*	0.1038*
N12	0.0681*	0.0809*	0.0934*	0.1257*	0.0712*	0.0815*	0.0941*
N13	0.0582*	0.0622*	0.1128*	0.0808*	0.1607*	0.1074*	0.1081*
Composite Liquidity Standard	0.9674*	0.7401*	0.1838*	0.7307*	0.0591*	0.1367*	0.0709*
Composite Capital Standard	0.2435*	0.2314*	0.1779*	0.2565*	0.1532*	0.2616*	0.5306*

	dsbreach N11	*dsbreach* N12	*dsbreach* N13	Composite Liquidity Standard	Composite Capital Standard
N11	1				
N12	0.1526*	1			
N13	0.1600*	0.1597*	1		
Composite Liquidity Standard	0.0943*	0.0944*	0.0766*	1	
Composite Capital Standard	0.5925*	0.2498*	0.3980*	0.2840*	

Source: Own calculations based on Interfaks, RET and CBR. More detailed information on variable construction is provided in Table 2.1.

TABLE 2.4

Descriptive statistics

	In Sample of Estimation
Analysis time	1999:Q1 - 2002:Q4
No. of banks	1443
No. of failures	194

Reason of Failure	Percent	Cum.
Violation of bank legislation	30.81	30.81
Compulsory Bankruptcy	64.72	95.53
Voluntary liquidation	4.47	100

Source: Own calculations based on CBR. Note: The calculations of the compliance variables are based on the period 1997:Q2 - 2002:Q4. The estimation sample is restricted to the period 1999:Q1 - 2002:Q4. More detailed information on variable construction is provided in Table 2.1. Detailed information on regulatory standards is provided in appendix B.

TABLE 2.5

Regression Results for the Logit Model – Coefficient Estimates of Equation (1)

Dependent variable:	License withdrawal					
Regulatory violations measured as:	*(1) dnbreach*			*(2) dsbreach*		
	I (α=0.3)	*II* (α=0.5)	*III* (α=0.7)	*IV* (α=0.3)	*V* (α=0.5)	*VI* (α=0.7)
Constant	-4.8568***	-4.2327***	-3.8286***	-2.4839***	-2.3149***	-2.3934***
	[1.1575]	[0.9951]	[0.8417]	[0.5342]	[0.5373]	[0.6430]
Deflator	0.2101**	0.2478***	0.2587***	0.3080***	0.2957***	0.2626***
	[0.1047]	[0.0889]	[0.0828]	[0.0743]	[0.0769]	[0.0827]
Moscow Dummy	1.4742**	1.3252**	1.1280**	0.8439***	0.8135***	0.8885**
	[0.5777]	[0.5304]	[0.4663]	[0.2899]	[0.2930]	[0.3515]
Economic Variables						
Return on assets	-0.0065	-0.0061	-0.0054	-0.0152**	-0.0111*	-0.0067
	[0.0043]	[0.0045]	[0.0045]	[0.0061]	[0.0060]	[0.0057]
Cost/assets	0.1676***	0.1377***	0.1168***	0.0976***	0.0933***	0.0970***
	[0.0517]	[0.0437]	[0.0389]	[0.0236]	[0.0246]	[0.0307]
Interbank liabilities/liabilities	-0.0227**	-0.0180**	-0.0157**	-0.0036	-0.0044	-0.007
	[0.0101]	[0.0077]	[0.0070]	[0.0048]	[0.0047]	[0.0056]
Government securities/assets	-0.0022	-0.0144	-0.0118	0.0360***	0.0336***	0.0357**
	[0.0208]	[0.0204]	[0.0198]	[0.0124]	[0.0128]	[0.0147]
Regional market share (assets)	-0.0217	-0.0106	-0.0082	-0.0029	-0.0042	-0.0054
	[0.0252]	[0.0234]	[0.0213]	[0.0145]	[0.0134]	[0.0162]
Non performing loans/loans	0.0312***	0.0249***	0.0220***	0.0152***	0.0141***	0.0184***
	[0.0090]	[0.0074]	[0.0068]	[0.0041]	[0.0042]	[0.0063]
Reserves/assets	-0.1280***	-0.1146***	-0.1049***	-0.1059***	-0.1071***	-0.1186***
	[0.0245]	[0.0225]	[0.0206]	[0.0173]	[0.0175]	[0.0199]
Tacit CBR Objectives						
Regional Herfindahl (assets)	-0.0005**	-0.0004**	-0.0004**	-0.0003**	-0.0003*	-0.0002
	[0.0002]	[0.0002]	[0.0002]	[0.0001]	[0.0001]	[0.0002]
Size (log assets)	-0.3637***	-0.3968***	-0.3877***	-0.1925***	-0.2116***	-0.2925***
	[0.1084]	[0.1092]	[0.1005]	[0.0592]	[0.0590]	[0.0795]
Aggregate number of breaches	-7.0503***	-6.8104***	-6.1828***	-6.2475***	-6.4850***	-6.8531***
	[1.2993]	[1.2703]	[1.1516]	[0.9130]	[0.9196]	[1.0356]

(Continued)

TABLE 2.5 CONTINUED

	(1) dnbreach			*(2) dsbreach*		
	I (α=0.3)	*II* (α=0.5)	*III* (α=0.7)	*IV* (α=0.3)	*V* (α=0.5)	*VI* (α=0.7)
Compliance with Regulatory Standards						
Non-reported scores	1.3963***	1.3501***	1.3510***	1.5017***	1.5031***	1.1451***
	[0.3221]	[0.3004]	[0.2848]	[0.2299]	[0.2326]	[0.2798]
Capital adequacy ratio (N1)	0.0827	0.1627**	0.1636***	-0.0551	-0.0075	0.2438*
	[0.0635]	[0.0668]	[0.0482]	[0.0698]	[0.0588]	[0.1286]
Quick liquidity ratio (N2)	0.5289***	0.3609***	0.2738***	0.2343***	0.1335**	0.0464
	[0.0940]	[0.0631]	[0.0481]	[0.0669]	[0.0611]	[0.0791]
Current liquidity ratio (N3)	0.1988**	0.1252**	0.0936**	-0.5341	0.5205	1.9889***
	[0.0898]	[0.0587]	[0.0458]	[0.3477]	[0.4022]	[0.6895]
Long-term liquidity ratio (N4)	-0.1957	-0.1056	-0.0554	0.5553	1.1216	3.6602***
	[0.1894]	[0.1214]	[0.0914]	[0.8303]	[0.9327]	[1.2212]
General liquidity ratio (N5)	-0.0155	0.0336	0.0485	2.9008***	1.7809***	0.8242
	[0.0859]	[0.0600]	[0.0462]	[0.5298]	[0.4347]	[0.6321]
Large-risks-to-capital ratio (N7)	0.2159	0.1385	0.0863	-1.1979	4.6474	7.9862**
	[0.1501]	[0.0999]	[0.0742]	[3.0678]	[3.0297]	[3.5809]
Owner-related-credit-risks-	0.5311**	0.2926**	0.1778	1.3059***	0.9348*	1.0986*
to-capital ratio (N9.1)	[0.2151]	[0.1482]	[0.1172]	[0.4339]	[0.5432]	[0.6470]
Insider-related-credit-risks-	0.3559***	0.2443**	0.1702**	0.0055	0.0971	0.6097**
to-capital ratio (N10.1)	[0.1173]	[0.0981]	[0.0843]	[0.0761]	[0.1515]	[0.2432]
Individuals' deposits-	-0.0441	-0.047	-0.0493	-0.2952	-0.2254	-0.455
to-capital ratio (N11)	[0.0665]	[0.0567]	[0.0498]	[0.2192]	[0.2471]	[0.3368]
Investment-to-shares-	0.2748*	0.1356	0.0628	-0.1141	-0.7325	0.5381
to-capital ratio (N12)	[0.1633]	[0.1335]	[0.1006]	[0.7454]	[1.4356]	[1.2281]
Issued-promissory-notes-	0.0466	0.0233	0.028	0.0347	-0.2914	-0.435
to-capital ratio (N13)	[0.1077]	[0.0794]	[0.0629]	[0.3490]	[0.5711]	[0.5757]
Observations	19122	19360	19360	19086	19122	19145
Number of banks	1366	1366	1366	1355	1355	1358
Log Likelihood	-554.83	-534.9	-529.52	-538.68	-523.97	-520.32
Wald chi2	141.33	150.02	168.17	440.38	453.37	209

Note: The breach variables in the regression equation are: (1) discounted number of breaches assuming exponential smoothing: (I) *dnbreach (α=0.3),* (II) *dnbreach (α=0.5)*, (III) *dnbreach (α=0.7)*, (2) discounted severity of breaches assuming exponential smoothing: (IV) *dsbreach (α=0.3),* (V) *dsbreach (α=0.5)*, (VI) *dsbreach (α=0.7)*. The dependent variable is a dummy variable, license withdrawal, which equals one in the quarter when a bank's license was revoked and zero otherwise. Moscow is a dummy variable which equals one if the bank is located in Moscow and zero otherwise. The Herfindahl index is an average over time. All other variables are time-varying. Table 2.1 provides a more detailed description of all variables. The logit estimations are performed under the RE assumption. Robust standard errors are given in brackets. *, ** and *** indicate significance levels of 10, 5 and 1 percent respectively.

TABLE 2.6

Regression Results for the Logit Model – Coefficient Estimates of Equation (2) (Note: part of estimation output omitted)

Dependent variable:	License withdrawal							
Regulatory violations measured as:	*(1) Clusters of dnbreach (α=0.5)*				*(2) Clusters of dsbreach (α=0.5)*			
	I	*II*	*III*	*IV*	*V*	*VI*	*VII*	*VIII*
Compliance with Regulatory Standards								
Non-reported scores	1.4686***	1.4885***	1.5388***	1.7966***	1.3906***	1.3941***	1.3986***	1.1153***
	[0.2862]	[0.2765]	[0.2871]	[0.2706]	[0.2253]	[0.2268]	[0.2235]	[0.2321]
Composite Liquidity Standard	0.1851***	0.2197***	0.1408***	0.0624**	1.2681***	1.7845***	0.8420***	2.9781***
	[0.0316]	[0.0339]	[0.0368]	[0.0297]	[0.1616]	[0.2650]	[0.2872]	[0.5661]
Composite Capital Standard	0.0616***	0.0287	0.2879***	-0.0222	0.3142	0.4399	0.121	1.988
	[0.0220]	[0.0343]	[0.0613]	[0.0406]	[0.2861]	[0.6505]	[0.4926]	[1.3273]
Composite Liquidity*Herfindahl		-0.0000***				-0.0003***		
		[0.0000]				[0.0001]		
Composite Capital *Herfindahl		0.0000				0.0000		
		[0.0000]				[0.0002]		
Composite Liquidity*Size			0.0083				0.0954	
			[0.0057]				[0.0592]	
Composite Capital *Size			-0.0458***				0.1164	
			[0.0115]				[0.1274]	
Composite Liquidity* Aggregate number of breaches				0.3243***				-3.1719***
				[0.0708]				[0.9603]
Composite Capital * Aggregate number of breaches				0.2024**				-3.2768
				[0.1032]				[2.4641]
Observations	19360	19360	19360	19360	19360	19360	19360	19360
Number of banks	1366	1366	1366	1366	1366	1366	1366	1366
Log Likelihood	-554.31	-550.74	-543.37	-530.85	-616.51	-611.73	-614.22	-603.82
Wald chi2	149.71	170.88	157.74	177.31	318.26	319.31	323.73	282

Note: The breach variables in the regression equation are: (1) the sum of *dnbreach* of standards 2, 3, 4 and 5 (α=0.5), (2) the average of *dsbreach* of standards 1, 71 9.1, 10.1, 11, 12 and 13 (α=0.5). The dependent variable is a dummy variable, license withdrawal, which equals one in the quarter when a bank's license was revoked and zero otherwise. Next to compliance with regulatory standards, we also include economic and tacit objectives as in Table 2.5. To ease presentation of results, these coefficients are omitted The logit estimations are performed under the RE assumption. Robust standard errors are given in brackets. *, ** and *** indicate significance levels of 10, 5 and 1 percent respectively.

Chapter 3

The sequence of bank liberalization: Financial repression versus capital requirements in Russia.

3.1 Introduction

Reserve requirements are widely used as a tool of monetary policy aimed at maintaining financial stability. Typically, compulsory reserves yield a low or even zero return. In an economy with high inflation, this return is often negative in real terms, and consequently causes distorted incentives for bank asset allocation decisions. When this occurs, reserve requirements become a tool of *financial repression*.

After the collapse of the Soviet economy, many transition economies embarked on a process of bank market liberalization that led to increased competition. Governments started to abolish or loosen interest rate regulations and asset choice restrictions and gradually reduced barriers to entry. Banks were forced to compete more aggressively in the loan and deposit markets, thereby lowering their current and future expected profits. This led banks to engage in more risky activities. The opportunities for increased bank riskiness further expanded as a number of restrictions on bank activities were softened or abolished. Activities that were previously precluded, such as derivatives and foreign currency trading and real estate lending, further opened up opportunities to shift the profile of banks toward more risky projects.

Along with financial liberalization, governments installed new bank regulations governing the classification of problem loans and mandatory provisions for non-performing loans. New accounting rules and tighter standards were adopted. Minimum capital requirements (following the Basel Accords) were imposed, as were higher initial capital base requirements and stricter regulations on banks' exposure to a single borrower (Gorton and Winton, 1998).

Russia represents a country in which reserve requirements, together with other *financially repressive* measures, effectively put a tax on the banking sector. Moreover, a number of prudential regulations aimed at lowering bank risk behavior were installed.[1]

Specifically, on April 1, 1996, the Central Bank of Russia (CBR) introduced a new and revised set of prudential regulations, taking into account international banking practices.[2] The new prudential bank standards include, in addition to minimal capital requirements, regulations on capital adequacy requirements, liquidity requirements, credit risk requirements, and a number of non-compulsory guidelines. In 1998, a new accounting system came into force that moved away from Russian accounting standards toward international accounting standards. In April 2004, an updated version of Instruction No. 1 came into effect, which intended to reduce the opportunities and incentives for banks to manipulate their accounts. Most recently, in 2005, the CBR screened and approved all banks that want to participate in the implementation of a deposit insurance agency (Tompson, 2004). Although the main motivations for introducing a deposit insurance scheme are to increase public confidence, promote financial stability (prevent bank runs) and enhance competition (levelling the playing field with Sberbank), it may cause banks to behave less prudently and resort to 'gamble for their resurrection' (Kane, 1989). As a result, banks choose a risky asset portfolio that pays out high profits when gambling is successful, but leave the deposit insurer with the losses if the gamble fails.

In the countries of Central and Eastern Europe, governments started bringing down reserve requirements, while at the same time introducing capital requirements. Financial repression, however, remained high. Table 3.1 shows the evolution of reserve requirements (β), the return on the reserves (r^r) and inflation for four Eastern

[1] Emerging financial markets often tend to be restricted by rules governing the composition of bank balance sheets, such as high reserve requirements, interest-rate ceilings, foreign-exchange rate regulations and other types of explicit or implicit taxes on the financial sector (Denizer et al., 1998). For an analysis of the optimal degree of financial repression, see e.g. Bencivenga and Smith (1992) who develop a model in which an increase in reserve requirements represses the development of the financial system.

[2] These regulations are summarized in the CBR Instruction No. 1 of January 30, 1996, "On the Procedure for Regulating the Activities of Credit Organisations".

European transition countries for the period 1993-1999. Even when reserves were remunerated, the return was often negative in real terms. In Russia, the CBR has set (zero return) reserve requirements varying between 5 and 22 percent for different deposit classes (Figure 3.5). In the EMU countries, reserve requirements are set at 2 percent and are remunerated at the EONIA rate.

Table 3.1: Reserve requirements (β), return on reserves (r^r) and inflation (%).

	Croatia			Estonia		
	β	r^r	$inflation$	β	r^r	$inflation$
1993			1446.7	10	0	89.9
1994		5.15	107.3	10	0	47.7
1995	39.5	5.5	4	10	0	28.7
1996	35.9	5.5	4.3	10	0	23.1
1997	32	4.5	4.1	10	0	10.6
1998	30.5	5.9	6.4	10	0	8.2
1999	30	5.9	3.7	13	EONIA	3.3
	Hungary			Romania		
	β	r^r	$inflation$	β	r^r	$inflation$
1993		3	22.6		10	254.4
1994	12	8	18.8		25	137
1995	17	15.5	28.4		9.1	32.3
1996	12	14	23.5		12	38.8
1997	12	14	18.3		15	154.8
1998	12	10	14.4	15	10.25	59.1
1999	12	8.25	10.3	25	9.5	45.8

Source: Schoors (2002).

In an environment characterized by financial repression, the adoption of Western-style bank regulation and supervision might produce adverse effects. While liberalization may increase the riskiness of the banking system and weaken its function as an intermediary for investment and growth, prudential regulation is especially designed to reduce such perverse risk incentives. The introduction of new bank regulation and supervision therefore needs to be optimally sequenced in conjunction with the process of liberalization and the easing of financial repression, in order to avoid financial crises and to build a well-functioning credit market.

In this chapter we highlight one particular aspect of financial repression: the presence of high, but lowly compensated reserve requirements and its effects on bank risk-taking. We model the interaction between reserve requirements, capital adequacy rules and risk-taking by banks in a stylized transition-economy environment. We focus specifically on capital requirements because they are able to offset

risk behavior due to a loss in franchise value.[3] Although we think that our findings have broad implications for financial regulatory design in emerging markets, we focus our arguments on the setting in the transition countries of Central and Eastern Europe.

3.2 The model

Our model builds on the framework used in Hellmann, Murdock and Stiglitz (2000), who use a dynamic model of moral hazard in which competition can undermine prudent bank behavior. They find that while capital requirements may succeed in reducing gambling behavior, they negatively affect banks' franchise values, and thus induce gambling behavior. Therefore, they advocate the use of deposit rate ceilings to sustain bank franchise value as a Pareto improvement compared to capital requirements. Repullo (2004) extends the model by Hellmann et al. (2000) and investigates the effects of introducing a risk-based capital requirement and deposit rate ceilings in a dynamic model of imperfect competition. Our model builds on the framework used in Hellmann et al. (2000), but we focus on assessing how bank risk-taking behavior changes when capital requirements are introduced in a financially repressed economy. By introducing reserve requirements on the bank's asset side, we can analyze the effects of reducing financial repression and simultaneously investigate the interplay with the introduction of risk-based capital requirements.

Consider an infinite horizon model with $N > 2$ banks. The balance sheet of each bank $j = 1, ..., N$ consists of two assets, loans L and reserves R, and two liabilities, deposits D and capital C. In each period, the bank offers an interest rate r_j^d in competition with the other banks who offer r_{-j}^d.[4] Depositors are protected by a deposit insurance scheme, such that the total volume of deposits for bank j can be denoted by $D\left(r_j^d, r_{-j}^d\right)$, which are increasing in the bank's own interest rate and decreasing in the competitor's rate ($\partial D_j/\partial r_j^d > 0$ and $\partial D_j/\partial r_{-j}^d < 0$).[5] All banks are subject to prudential regulation under the form of a risk-based capital

[3] See for example Rochet (1992), Dewatripont and Tirole (1994).

[4] We do not model the form of competition explicitly. For an overview on issues concerning competition and bank stability, see Carletti and Hartmann (2002). Repullo (2004) used the framework of Hellmann et al. (2000) to introduce the effects of imperfect competition via a framework à la Salop. He finds that imposing deposit rate ceilings do not always guarantee the existence of a prudent equilibrium.

[5] While many transition economies adopted an explicit deposit insurance scheme by the mid-1990s, Russia has only initiated a framework for deposit insurance in 2005. See Demirguç-Kunt and Sobaci (2000) for an overview of deposit insurance around the world.

requirement k, $0 < k < 1$, such that for all banks j, $C_j \geq kL_j$ must hold.[6] Each bank j chooses the amount of capital $C_j = k_j L_j$, subject to $k_j \geq k$. Further assume that the opportunity cost of capital is exogenous and denoted by ρ.[7] After funds have been raised, each bank allocates its assets. Banks have to maintain part of their deposits with the central bank due to the reserve requirement. For each bank j, $R_j = \beta D_j$ holds, and the reserve requirement R pays an interest rate r^r.[8] We assume that r^r is below the risk-free rate in order to capture one pervasive aspect of financial repression still present in many transition economies. In what follows, we will refer to financial repression as the situation in which $r^r = 0$ and $\beta > 0$.

Assumptions Following Hellman et al. (2000) and Repullo (2004), we assume that banks invest the remaining funds in either of two assets: a prudent loan, which yields a return of α, or a gambling asset, which yields a return of γ with probability θ and 0 with probability $1 - \theta$. We further assume that:

$$\gamma > \alpha > \theta\gamma, \tag{3.1}$$

$$\rho > \alpha, \tag{3.2}$$

$$\alpha > r^r, \tag{3.3}$$

$$\alpha > \rho k. \tag{3.4}$$

Condition (3.1) implies that the gambling asset is dominated in terms of expected return by the prudent loan but yields a higher payoff when the gamble succeeds. Condition (3.2) captures the problem of moral hazard in banking, namely that bank capital is costly. If bank capital were not so costly, regulators would be able to

[6] The capital requirement is risk-based because the minimal capital requirement is a function of the only class of risky assets, i.e. loans. Belarus, Bulgaria, the Czech Republic, Estonia, Hungary, Poland, Romania, the Slovak Republic, Slovenia and the Ukraine have all adopted the Basel I 8% risk-weighted capital-to-assets ratio, although this does not imply much about its enforcement (see Claeys et al. (2005) for an assessment of the enforcement of prudential regulation in Russia).

[7] This implies an elastic supply of capital funds.

[8] When the rate at which reserves are compensated is lower than the risk-free rate, banks are assumed not to hold voluntarily more reserves than what is required by the central bank. If the risk-free rate were lower, a bank could achieve infinite profits by borrowing at a market rate and holding infinite reserves (Mitchell, 1982). However, even when reserves are not compensated, some banks in transition economies do hold excess reserves because they have only few alternatives to allocate their assets or are faced with low enforcement of creditor rights (Denizer et al., 1998).

force banks to hold sufficient capital in order to induce prudent lending without any protest from the banks. Condition (3.3) unveils a typical feature of financial repression. Specifically, the return on reserves is lower than the interest rate on the prudent loan. Finally, condition (3.4) states that the *capital cost of loans* should never exceed the return on the prudent loan. If this were the case, no bank would have an incentive to lend prudently.

Timing Each bank j receives a license from the regulator to operate at an initial date $t = 0$. The asset choice of the bank is not observed by the depositors nor the regulator. At the end of each period, the regulator inspects the balance sheet of all banks. When a bank is revealed to be insolvent and cannot repay its depositors, its licence is withdrawn. Following Hellmann et al. (2000), a gambling bank will earn an insufficient return to repay depositors in case the gamble fails.

Prudential regulation in Russia comprises a number of regulatory standards, among which capital adequacy and liquidity rules, with which banks need to comply in order to maintain their bank license. Although enforcement of these regulations is low in general and often entail only minor punitive fines, some enforcement in terms of license withdrawal is observed for capital and liquidity regulations (see chapter 2). In contrast to what the model assumptions imply, gambling banks may be able to repay depositors, even when the gamble fails. Only in the acute case when a bank's capital falls below a specified level such that its solvency is at stake, some regulatory intervention would be warranted.[9] We assume that failure of the gamble implies the forced closure of the bank.

All banks simultaneously choose the level of capital and offer a deposit rate. All banks maximize their expected discounted profits: $V = \sum_{t=0}^{\infty} \delta^t \pi_t$, hence strategies will correspond to the infinitely repeated static Nash equilibrium. V is a measure of the bank's franchise value, in which higher levels of the discount factor δ result in higher expected discounted profits. Depositors choose the bank at which they want to place their funds, after which banks choose to lend prudently or gamble. When returns are realized, the regulator checks the balance sheet.

[9] In this spirit, prompt corrective action rules were introduced in 1991 in the US by the Federal Deposit Insurance Corporation Improvement Act (FDICIA) to allow for early intervention in problem banks to save them from becoming insolvent (Goldberg and Hudgins, 2002). PCA aims at preventing banks from "gambling for their resurrection" (Kane, 1989) by enabling regulators to close down failing banks, even at a positive level of capital.

3.3 Competitive equilibrium

3.3.1 The model with the prudent asset

At each time t, each bank j chooses the optimal amount of capital it wants to hold via the capital requirement k_j and offers a deposit rate r_j^d. The bank places a fraction β of its deposits with the central bank to comply with the reserve requirement. The reserves yield a return r^r. The remaining funds are invested in the prudent asset, a loan which yields a return α. Banks incur a fixed cost μ due to the monitoring of borrowers' actions.[10] The per-period profits for each bank j are:

$$\pi_j^P(r_j^d, r_{-j}^d, k_j) = \alpha L_j + r^r R - r_j^d D_j - \rho C_j - \mu_j. \tag{3.5}$$

This can be rearranged via the balance sheet constraints $C_j = k_j L_j$, $R_j = \beta D_j$ and $L_j = D_j + C_j - R_j$, such that the problem of bank j at date t becomes:

$$\max_{k_j \geq k} \pi_j^P(\cdot) = \left[r^r \beta - r_j^d + \frac{(1-\beta)}{(1-k_j)} \cdot (\alpha - \rho k_j) \right] \cdot D_j \left(r_j^d, r_{-j}^d \right). \tag{3.6}$$

Differentiating the objective function (3.6) with respect to k_j, and using assumption (3.2), gives:

$$(1-\beta) \cdot [\alpha - \rho] \cdot D_j(\cdot) < 0, \tag{3.7}$$

in which the strict inequality follows from (3.2) and we thus have the corner solution $k_j = k$. Indeed, when the cost of capital exceeds the return on the prudent asset, no bank has an incentive to hold any capital above the legal requirement. Substituting this result into the objective function (3.6) and differentiating with respect to r_j^d gives the following first order condition:

$$-D_j + \left[r^r \beta - r_j^d + \frac{(1-\beta)}{(1-k)} \cdot (\alpha - \rho k) \right] \cdot \partial D_j / \partial r_j^d = 0. \tag{3.8}$$

For a symmetric Nash equilibrium we set $r_j^d = r_{-j}^d = r_P^d$, where r_P^d is the equilibrium deposit rate when the bank chooses to lend prudently. Let $\varepsilon = \partial D / \partial r^d \cdot r^d / D$, then the equilibrium prudent deposit rate is given by:

$$r_P^d = \left[r^r \beta + \frac{(1-\beta)}{(1-k)} \cdot (\alpha - \rho k) \right] \cdot \frac{\varepsilon}{\varepsilon + 1}. \tag{3.9}$$

[10] One alternative way to incorporate monitoring into the model is to let banks incur a variable cost depending on the volume of loans. Gropp and Vesala (2004) and Cordella and Yeyati (2002) let borrowers' default risk depend on the amount of monitoring.

From (3.9) and (3.2) we can infer that r_P^d is decreasing in the capital requirement k. The higher k, the more solvent a bank becomes and thus the less it has to pay depositors for the risk they take by entrusting their savings to the bank. When there is financial repression, one can derive that the intermediation margin increases with the reserve requirement. Higher reserve requirements impose a tax on deposits and banks will be induced to pass this tax on to the depositors in the form of lower deposit rates. This finding is consistent with empirical evidence for Russia (Karas, Pyle and Schoors, 2005) and Latin America (Brock and Suarez, 2000). If there were neither capital nor reserve requirements, $r_P^d = \alpha \cdot \frac{\varepsilon}{\varepsilon+1}$. In this case, when competition for deposits becomes sufficiently high ($\varepsilon \to \infty$), the prudent deposit rate approaches α and the equilibrium intermediation margin approaches zero. Competition can thus be seen as one of the main causes of lower intermediation spreads and the associated erosion of bank franchise value. If this effect starts to dominate, banks will be induced to gamble.

3.3.2 The model with the gambling asset

Each bank j chooses the optimal amount of capital via k_j and raises deposits by offering a deposit rate r_j^d. The bank again places a fraction β of its deposits with the central bank (with a return r^r, $0 < r^r < \alpha$), but now invests the remaining funds in the gambling asset. The per-period profits for each bank j become:

$$\pi_j^G(r_j^d, r_{-j}^d, k_j) = \theta \cdot \left[\gamma L_j + r^r R - r_j^d D_j\right] - \rho C_j - \mu_j. \tag{3.10}$$

The bank's objective function is similar to the one with the prudent loan, but now the return on the loan is γ instead of α and the total profit depends on whether the gamble is successful or not. When it is successful, the bank gets a high return and can repay its depositors. When the gamble fails, the bank will be closed down. As before we can use the balance sheet constraints to identify the objective function of each bank j:

$$\max_{k_j \geq k} \pi_j^G(\cdot) = \left\{\theta \cdot \left[r^r \beta - r_j^d\right] + \frac{(1-\beta)}{(1-k_j)} \cdot [\theta\gamma - \rho k_j]\right\} \cdot D_j\left(r_j^d, r_{-j}^d\right). \tag{3.11}$$

Differentiating (3.11) with respect to k_j and using assumptions (3.1) and (3.2) gives:

$$(1-\beta) \cdot [\theta\gamma - \rho] \cdot D_j < (1-\beta) \cdot [\alpha - \rho] \cdot D_j < 0, \tag{3.12}$$

so that $k_j = k$ will always hold, similar to the case of prudent lending.

Substituting this result into the objective function (3.11) and differentiating with respect to r_j^d gives the following first order condition:

$$-\theta D_j + \left[\theta \cdot [r^r\beta - r_j^d] + \frac{(1-\beta)}{(1-k)} \cdot (\theta\gamma - \rho k)\right] \cdot \partial D_j/\partial r_j^d = 0. \tag{3.13}$$

The symmetric Nash equilibrium is again obtained by setting $r_j^d = r_{-j}^d = r_G^d$. Solving (3.13) for r_G^d yields the equilibrium deposit rate when the bank chooses the gambling asset:

$$r_G^d = \left[r^r\beta + \frac{(1-\beta)}{(1-k)} \cdot (\gamma - \rho k/\theta)\right] \cdot \frac{\varepsilon}{\varepsilon + 1}. \tag{3.14}$$

We again obtain that when there are neither capital nor reserve requirements, competition may lead to intermediation margins that approach zero. Further, as long as the capital requirement does not exceed $\overline{k} = \theta/(1-\theta) \cdot (\gamma - \alpha)/\rho$, the bank is willing to offer a higher deposit rate than when it chooses to lend prudently. In what follows, we assume that $k < \overline{k}$ always holds. This leads to the following condition for each $k > 0$:

$$\frac{(\theta\gamma - \rho k)}{\theta} > (\alpha - \rho k), \tag{3.15}$$

namely that the (one period) net gain from gambling, conditional on gambling being successful, should always exceed the (one period) net gain from lending prudently. Would this condition not be fulfilled, no bank would have an incentive to gamble.

3.3.3 The no-gambling condition: rationality constraint

Now that we have separately analyzed the cases of a prudent and a gambling equilibrium, we can derive conditions under which either of the two equilibria will occur. We follow the approach of Hellmann et al. (2000) and derive a critical deposit rate, r^{crit}, under which the equilibrium deposit rate has to lie such that banks will not be tempted to gamble in the asset allocation stage. Each bank compares its return from gambling or investing safely, conditional on the deposits it has raised. A bank will choose to invest prudently whenever its discounted expected return from prudent behavior exceeds the discounted expected return from gambling, i.e. whenever $V_G(\cdot) \leq V_P(\cdot)$. This is equal to the following condition:

$$\frac{\pi^G(\cdot)}{1 - \delta\theta} \leq \frac{\pi^P(\cdot)}{1 - \delta}, \tag{3.16}$$

or after rearranging:

$$\pi^G(\cdot) - \pi^P(\cdot) \leq (1-\theta) \cdot \delta \cdot \frac{\pi^P(\cdot)}{1-\delta}. \tag{3.17}$$

Condition (3.17) states that the one-period gain from gambling must be less than the (discounted) franchise value ($\delta V_P(\cdot)$) that the bank loses whenever the gamble fails (with probability $1-\theta$) (Hellman et al., 2000). Plugging in the profit functions (3.6) and (3.11), condition (3.17) becomes:

$$r_j^d \leq r^r\beta + \frac{(1-\delta\theta)}{(1-\theta)} \cdot \frac{(1-\beta)}{(1-k)} \cdot \alpha - \frac{(1-\beta)}{(1-k)} \cdot \left[\frac{(1-\delta)\theta}{1-\theta} \cdot \gamma + \delta\rho k\right]. \tag{3.18}$$

Let r^{crit} be the critical deposit rate for which each bank is indifferent between gambling and being prudent. From (3.18) we get:

$$r^{crit} = r^r\beta + \frac{(1-\beta)}{(1-k)} \cdot \{(1-\delta) \cdot [(\alpha - \theta\gamma)/(1-\theta)] + \delta \cdot [\alpha - \rho k]\}. \tag{3.19}$$

From (3.19) it is straightforward to see that:

$$\partial r^{crit}/\partial\alpha > 0,\ \partial r^{crit}/\partial\gamma < 0,\ \partial r^{crit}/\partial\theta < 0 \text{ and } \partial r^{crit}/\partial r^r > 0. \tag{3.20}$$

The higher the return on the prudent loan and the lower the return on the gamble and its probability of success, the less gambling will occur. Furthermore, an increase in the interest rate on required reserves will reduce gambling.

3.4 Financial liberalization and prudential regulation

Central banks use reserve requirements as a tool of monetary policy aimed at maintaining financial stability. Nonetheless, it does not explain why some governments resort to financial repression. Empirical evidence shows that countries with high reserve requirements grow more slowly and have less developed financial systems than countries with low reserve ratios (Haslag and Koo, 1999). While reserve requirements can function as a means to secure systemic stability, they hinder credit growth and financial development. Reducing financial repression should however be optimally sequenced, together with the introduction of prudential regulations in order to curb bank risk behavior.

In view of the frequent use of reserve requirements in transition economies, often with a negative real return, we investigate how the softening of financial repression

and the introduction of capital requirements affect banks' risk behavior.

3.4.1 Reserve requirements and gambling behavior

Central banks in emerging economies often use reserve requirements as one of their most important monetary policy tool. We focus specifically on how changes in the level of reserve requirements impact bank risk behavior. We can show that reserve requirements may indeed be useful in restricting bank risk-taking. More generally, in a financially repressed environment, we can show that the following proposition holds:

Proposition 1 *In a financially repressed environment ($r^r = 0$ and $\beta > 0$) and in the absence of a capital requirement ($k = 0$), a policy of reducing reserve requirements will increase gambling behavior.*

Proof. *The no-gambling condition is downward sloping and linear with respect to β, as long as $\delta < \widetilde{\delta}$, $\widetilde{\delta} \equiv \frac{(\alpha-\theta\gamma)-r^r(1-k)(1-\theta)}{(\alpha-\theta\gamma)+(1-\theta)\cdot(\rho k-\alpha)}$. For $r^r = 0$ and $k = 0$, $\widetilde{\delta} \to \infty$. Given that $\delta < 1$, $\delta < \widetilde{\delta}$ and $\left|\frac{\partial r^{crit}}{\partial \beta}\right| < \left|\frac{\partial r^d}{\partial \beta}\right|$ will always hold.* ■

Proposition 1 indicates that reducing reserve requirements in the absence of a capital requirement may increase bank risk behavior. Banks will maintain a low capital level, such that the capital-at-risk effect is quasi absent and gambling becomes a straightforward choice. Figure 3.1 illustrates how reducing reserve requirements may indeed increase gambling behavior of banks. Any reduction in required reserves leads banks to charge a higher deposit rate consistent with gambling behavior.

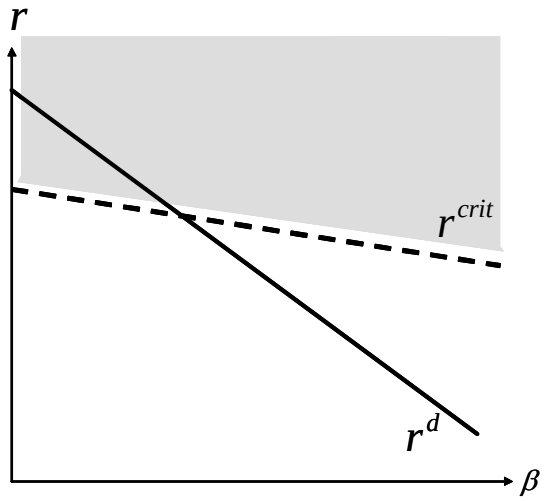
Clearly, easing financial repression may not be optimal in an environment characterized by low or badly enforced capital requirements. Before we assess the combined effect of introducing capital requirements in a banking environment characterized by financial repression, we replicate the result on capital requirements and risk behavior by Hellmann et al. (2000).

3.4.2 Capital requirements and gambling behavior

We can summarize the relationship between capital requirements and bank risk behavior in the following proposition:

Proposition 2 *For sufficiently myopic banks ($\delta \leq \overline{\delta}$), capital requirements can successfully reduce gambling behavior.*

Figure 3.1: Reserve requirements (β) and gambling behavior ($k = 0$). Note: shaded area represents gambling behavior.

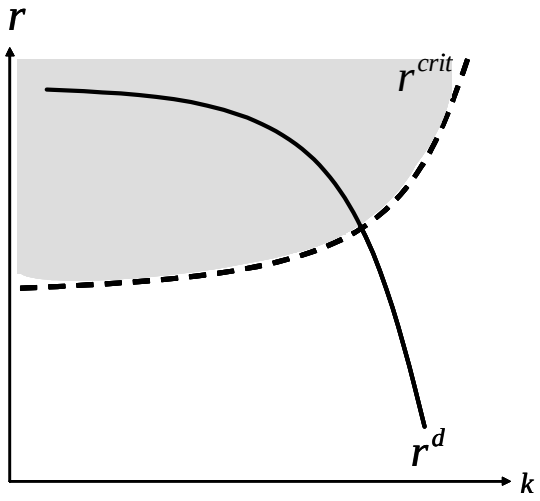


Proof. *The no-gambling condition is upward sloping and convex with respect to k, as long as* $\delta \leq \overline{\delta}$, $\overline{\delta} \equiv \frac{\alpha - \theta\gamma}{(\alpha - \theta\gamma) + (1-\theta)\cdot(\rho - \alpha)}$. ■

Proposition 2 results from the fact that higher capital requirements leave shareholders with a larger proportion of funds at stake. This should encourage more prudent behavior. Figure 3.2 graphically shows the result of proposition 2.

The result of proposition 2 hinges upon the assumption that banks are sufficiently myopic ($0 < \delta \leq \overline{\delta} < 1$). One of the main results in Hellmann et al. (2000) is that for more far-sighted banks ($\delta > \overline{\delta}$), a capital requirement may actually *increase* gambling behavior because in this case, the negative franchise-value effect dominates the capital-at-risk effect. It is important to note that threshold $\overline{\delta}$ is endogenous with respect to a country's institutional and regulatory characteristics. Specifically, banks in countries that are characterized by high levels of loan default risk (proxied by θ) and a high cost of capital (ρ) - both typical of emerging financial systems - will be relatively more far-sighted. In such an environment, capital requirements may hinder prudent bank behavior.

Figure 3.2: Capital requirements (k) and gambling behavior. Note: shaded area represents gambling behavior.



3.4.3 Capital requirements in a financially repressed banking system

Proposition 3 *In a financially repressed environment ($r^r = 0$ and $\beta > 0$) with a stable capital requirement ($k < \overline{k}$), a policy of reducing reserve requirements will increase gambling behavior.*

Proof. *The no-gambling condition is upward sloping and linear with respect to β, as long as $\delta > \widetilde{\delta}$, $\widetilde{\delta} \equiv \frac{(\alpha-\theta\gamma)-r^r(1-k)(1-\theta)}{(\alpha-\theta\gamma)+(1-\theta)\cdot(\rho k-\alpha)}$. For $r^r = 0$ and a capital requirement that satisfies condition (3.15): $k < \overline{k}$, $\overline{k} = \theta/(1-\theta)\cdot(\gamma-\alpha)/\rho$, it follows that $\widetilde{\delta} < 0$. Given that $0 \leq \delta < 1$, $\delta > \widetilde{\delta}$ and $\left|\frac{\partial r^{crit}}{\partial \beta}\right| < \left|\frac{\partial r^d}{\partial \beta}\right|$ will always hold.* ■

Figure 3.3 illustrates the result of proposition 3.

Proposition 4 *In a financially repressed environment ($r^r = 0$ and $\beta > 0$) with a capital requirement ($k < \overline{k}$), a combined policy of reducing reserve requirements and increasing capital requirements will only be successful in reducing gambling behavior as long as banks are sufficiently myopic.*

Proof. *The no-gambling condition is upward sloping and linear with respect to β, as in Proposition 3. For: $\delta < (>)\overline{\delta}$, we can show that $\frac{\partial r(\beta)^{crit}}{\partial k} < (>)0$* holds. ■

Figure 3.3: Reserve requirements (β) and gambling behavior ($k < \overline{k}$). Note: shaded area represents gambling behavior.

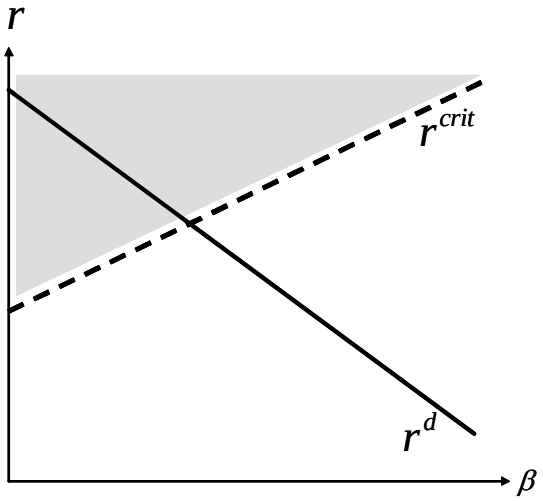


Figure 3.4: Reserve requirements (β), capital requirements (k) and gambling behavior ($0 < k_1 < k_2 < k_3 < \overline{k}$). Note: shaded area represents gambling behavior.

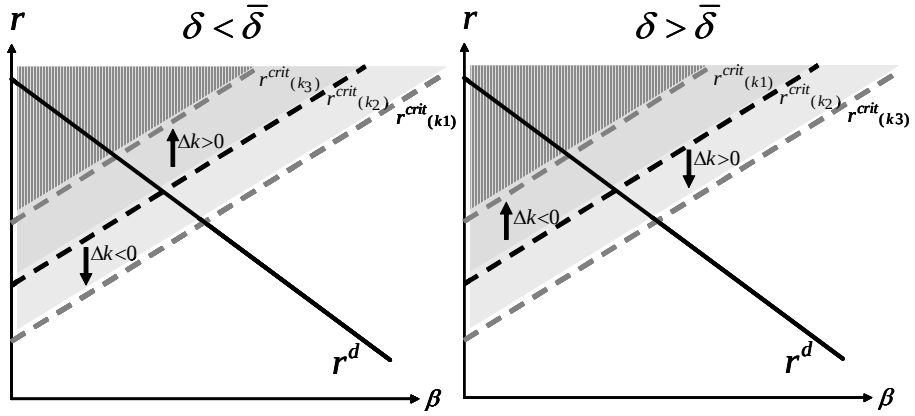


Figure 3.4 shows how the gambling region changes depending on banks' "far-sighted-ness". This depends on ρ and θ: for a low cost of capital and a relatively low loan default risk, a capital requirement can sooth the increase in risk behavior that follows from the easing of financial repression. Vice versa, in countries that are characterized by a high cost of capital and a high default probability of loans, a higher capital requirement will induce more gambling behavior and make a reduction in reserve requirements a less attractive liberalization option. The intuition behind this result is that for $\delta > \overline{\delta}$, the capital requirement causes the negative franchise-value effect to dominate the capital-at-risk effect, so that banks prefer to invest the freed up deposit funds in the gambling asset.

3.4.4 Evolution of capital and reserve requirements in Russia

We can divide the transition period of the Russian banking sector into 3 distinct periods, according to the evolution of capital and reserve requirements.

1. Period 1: June 1991 - April 1995

In the early years of the transition to a market-based banking system, the Central Bank of Russia introduced a system of reserve requirements, at that time its single tool of monetary policy. Reserve requirements were set at 2 percent on borrowed funds in June 1991, and steadily increased up to 22 percent for short term deposits by April 1995. With an annual inflation rate of 122 percent for the period January 1995 - April 1995 (Goskomstat), the banking sector potentially faced a heavy tax. One reason why the CBR resorted to financial repression was to reduce the inflationary effects of the monetary overhang that followed from large budget deficits in the early 1990s (Schoors, 2001). At that time however, reserve requirements did not impose a liquidity constraint on banks; banks held on to high excess reserves - 57 percent by end 1992 - and substituted these with alternative low-risk (and relatively liquid) assets in the form of treasury bills by the end of 1994, when the Ministry of Finance started to issue so-called GKO's (Korhonen, 1997).

Although the CBR did not have an official banking supervision department until 1993, in May 1991, the CBR set a capital requirement for low risk assets at 10 percent and for high risk assets at 15 percent (see Table 3.2). These requirements were however not compulsory and therefore not enforced. In March 1995, the capital requirements were even temporarily abolished. Given the high level of excess reserves due to the lack of more profitable investment opportunities, and the lack

of a proper supervisory framework, we can safely claim that any changes in bank portfolio composition that occurred in period 1 cannot be attributed to changes in either reserve or capital requirements.

Table 3.2: Evolution of capital requirements in Russia

May 1991 – 10% to 15% (non-compulsory) March 1995 – no official requirement July, 1996 – 5% February, 1997 – 6 % February, 1998 – 7 %		
5 million euro	*1 to 5 million euro*	*< 1 million euro*
February, 1999 – 8 % January, 2000 – 10 %	February, 1999 – 9 % January, 2000 – 11 %	

Source: Central Bank of Russia.

2. Period 2: May 1995 - March 1999

Figure 3.5 shows the monthly evolution of the banking sector aggregate of required and excess reserves relative to the requirements for the period 1995-2003. In period 2, reserve requirements were gradually reduced from 22 to 5 percent for short term deposits. Since all deposits are demand deposits by law (Tompson, 2004), it is clear from figure 3.5 that even the banking sector's *total* reserves were not sufficient to fulfill the short-term reserve requirement at any time before September 1998. We can conclude that before September 1998, the reserve requirement was not properly enforced.

Following a peak of 97 bank failures in May 1996 (see figure 2.1), the CBR introduced a capital requirement of 5 percent in July 1996, and gradually increased it to 9 percent in February 1999. In chapter 2, we found weak evidence consistent with enforcement of the capital adequacy standard. According to our model, a capital requirement should then reduce bank risk behavior.

However, when looking at various risk measures for Russian banks, bank risk behavior did not decline significantly before April 1999. In August 1998, a banking crisis unfolded as a result of the devaluation of the rouble and the consequent government default on its treasury bills. Reported non-performing loans started to decline only in June 1999 while the share of loan loss reserves to total assets started to diminish in July 1999 (figure 3.6). These figures seem to indicate that the capital requirement played at best only a marginal role in curbing bank risk behavior in period 2.

Figure 3.5: Monthly average reserve requirements (short- and long-term funds), banking sector aggregate required and excess reserves in Russia (1995:11-2003:8, %). Source: own calculations based on CBR and Goskomstat.

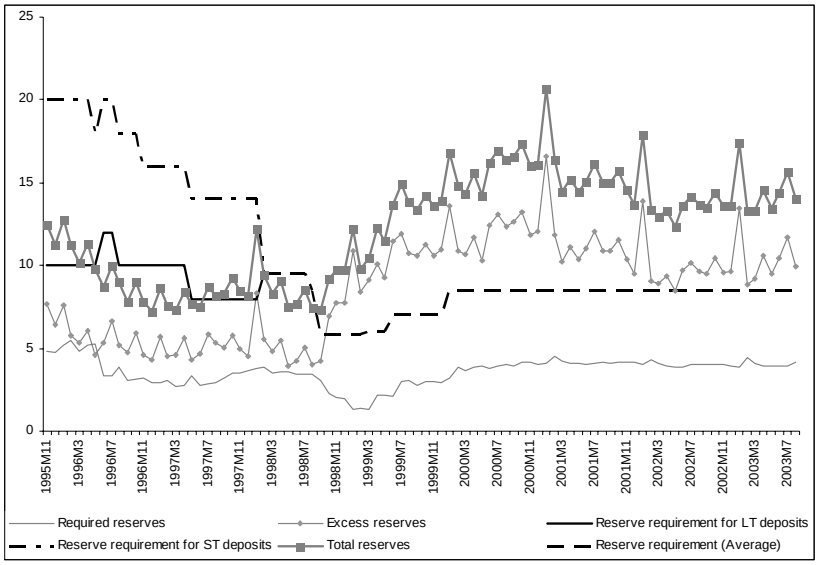
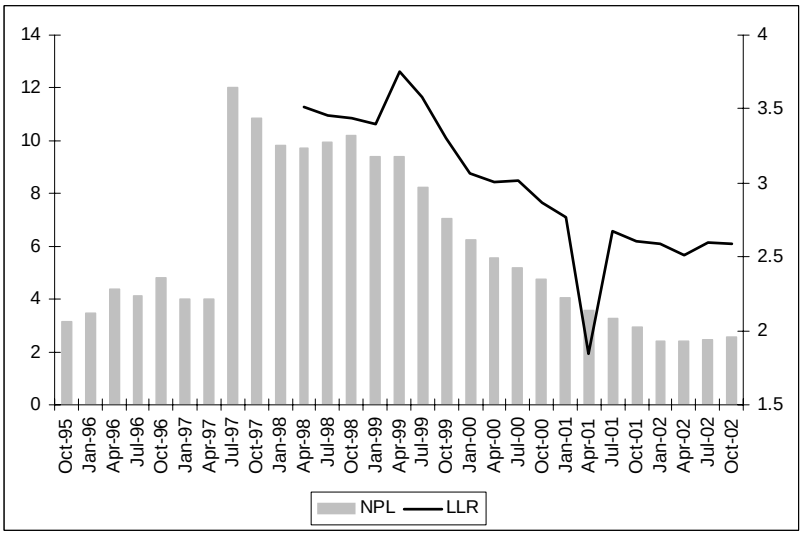


Figure 3.6: Non-performing loans (as a percentage of total loans, NPL left scale) versus loan loss reserves (as a percentage of total assets, LLR right scale) (1995:Q4-2002:Q4, %). Source: own calculations based on Mobile and Interfax.



3. Period 3: April 1999 - March 2004

For period 3, figure 3.5 reveals that from April 1999, the banking sector's required reserves gradually started to pick up following the increase in the reserve requirements from 5 to a maximum of 10 percent for funds denominated in foreign currency. With an average annual inflation rate of 58 percent for the period April 1999 - January 2000 (Goskomstat), it remains unclear why banks additionally preferred to hold on to a large share of excess reserves (11 percent on average) and refrained from investing in more profitable assets. In 1994, the Russian banking sector also suffered from a large share of excess reserves. Schoors (2001) argues that in 1994 this was due to inefficiencies in the payments system and excess liquidity. Between April 1999 and January 2000, capital requirements increased further from 9 to 11 percent. Between January 2000 and March 2004, both reserve and capital requirements remained unchanged at 10 and 11 percent respectively, while inflation was, on average, 16 percent (Goskomstat).

Given these characteristics, can we assess how bank risk behavior reacted to the changes in both capital and reserve requirements in Russia? Figures 3.7 and 3.8 show the correlation of the banking sector aggregate reserve and capital requirements with the two measures of bank risk behavior, namely the share of non-performing loans to total loans and the share of loan loss reserves to total assets. The right panel of figure 3.7 displays the correlation of non-performing loans with the capital adequacy ratio as specified in CBR Instruction No. 1 of January 30, 1996. Correlations are shown for period 2 and 3 separately and for the whole period for which we have data (top to bottom). Although the scatter plots do not allow us to draw any conclusions about the causality of the relationship, we find indications of a positive relationship. On average, higher capital adequacy does not seem to lead to a reduction in bank risk behavior. Interestingly, the correlation between the simple capital-to-assets ratio and loan loss reserves is not that clear cut (left panel of figure 3.7). The data indicate a slightly negative, but convex relation, which suggests that for higher levels of capital, risk behavior starts to increase again. Taken together, these results suggest a perverse impact of capital requirements with respect to risk behavior for the Russian banking sector.

Figure 3.8 shows indications of a negative relationship between reserve requirements and both non-performing loans and the share of loan loss reserves. This is in line with the prediction made in proposition 3. Combined, the data indicate that the introduction (or better enforcement) of capital requirements did not lead to the

desired reduction in risk behavior. Therefore, the temporary increase of reserve requirements, and thus increase in financial repression by the CBR in the period after the crisis of 1998 seems justified in hindsight. The CBR could hereby avoid the scenario in which banks would react to capital requirements by resorting to gambling behavior. Only when the cost of capital is reduced and loan default probability is lowered - for example by improving monitoring and screening skills - will a capital requirement achieve its purpose of reducing bank risk behavior. Consequently, financial repression can successfully be reduced to enhance credit growth to the economy without inducing gambling behavior.

3.5 Concluding remarks

The theoretical model predicts that the reduction of financial repression may increase risk behavior, while the introduction or enforcement of a capital requirement can be useful in reducing gambling behavior. When introducing capital requirements into a financially repressed economy, risk taking will be reduced, as long as banks behave in a sufficiently myopic way. However, in an environment characterized by high costs of capital and high default risk of loans, the introduction of a risk-based capital requirement may not succeed in reducing gambling. This suggests that as long as capital is costly, financial repression can be more successful in reducing risk compared to a capital requirement. Before introducing a capital requirement, measures aimed at lowering the cost of capital should therefore be a primary focus. Only when capital requirements can successfully reduce bank risk behavior, can financial repression harmlessly be diminished.

The data for the Russian banking sector revealed that this has not yet been the case for the period 1995-2003. Simple econometric tests suggest, but do not establish proof of, a perverse impact of capital requirements with respect to risk behavior of Russian banks in the past. The temporary increase of reserve requirements of the CBR after the crisis in August 1998 was therefore useful in curbing bank risk behavior.

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Figure 3.7: Capital adequacy (according to N1) versus non-performing loans (percentage of total loans) (1997:Q2-2002:Q4) and capital (percentage of total assets) versus loan loss reserves (percentage of total assets) (1995:M11-2003:8). Source: Own calculations based on Interfax and Mobile.

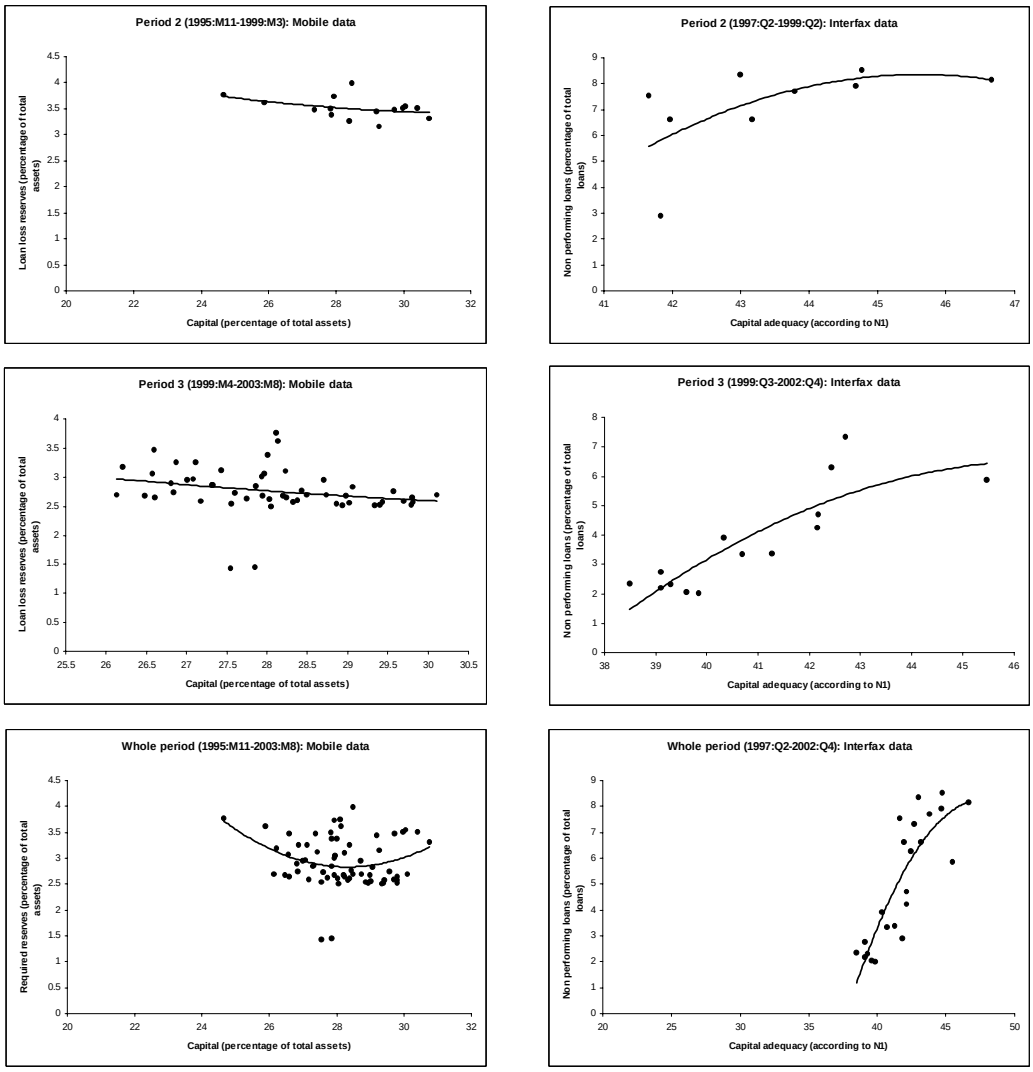
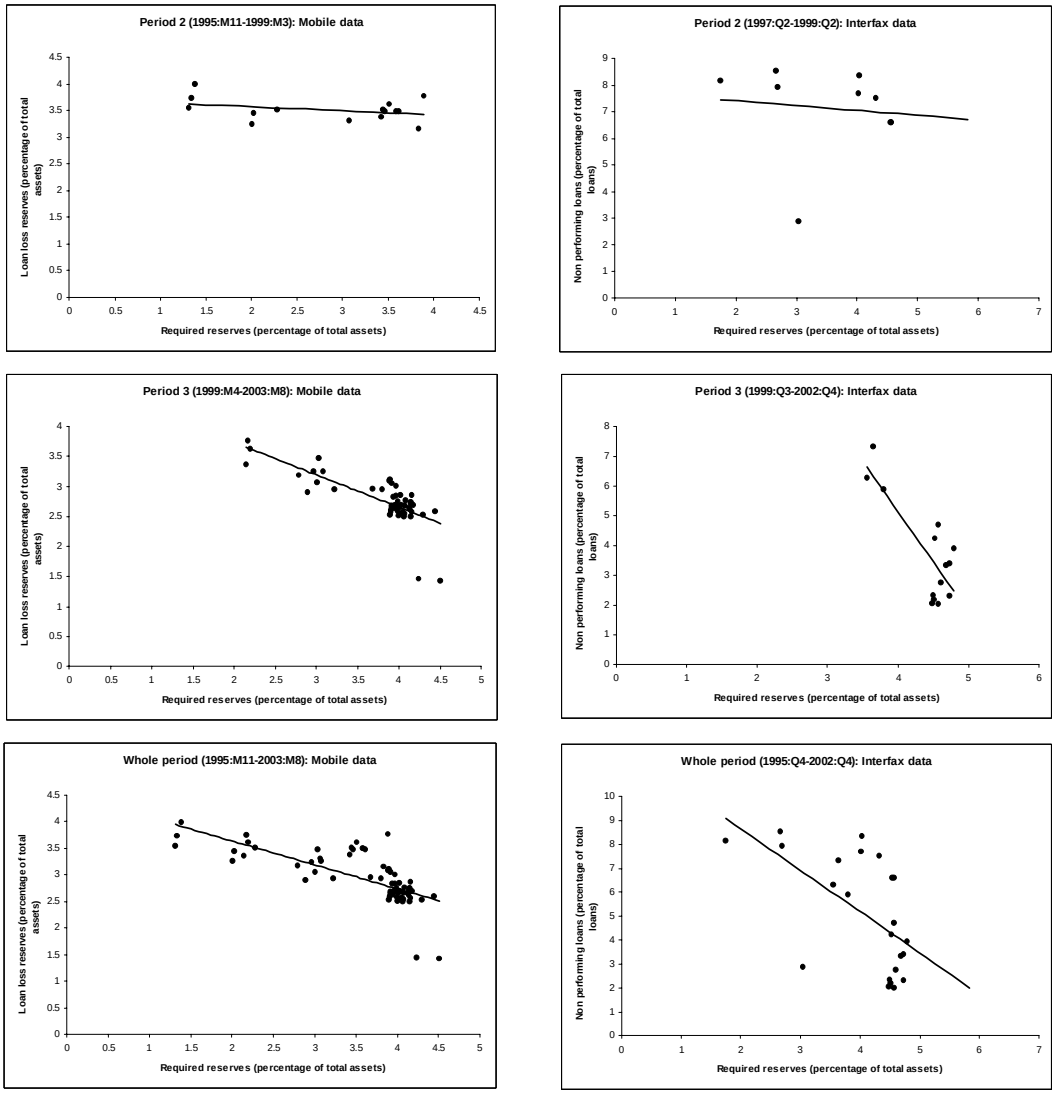


Figure 3.8: Required reserves versus non-performing loans (1995:Q4-2002:Q4) and loan loss reserves (1995:M11-2003:M8). Source: Own calculations based on Interfax and Mobile.



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Part II

Eastern Europe

Chapter 4

Determinants of bank interest margins in Central and Eastern Europe: A comparison with the West.[1]

4.1 Introduction

Financial intermediation is essential for economic development. Some authors have provided evidence of a causal link between the degree of financial intermediation and subsequent economic growth (Levine and Zervos, 1998). This issue is particularly important for the Central and Eastern European transition Countries (CEEC), where the financial infrastructure had to be reshaped after the collapse of the centrally planned system. The consensus is that these countries need a stable and efficient banking system, as well as the gradual development of financial markets, in order to finance both private and public investment and expenditures. The effectiveness of the banking system in channelling funds from surplus to deficit actors is often gauged by examining the spread between lending and deposit rates and by assessing the degree of operational efficiency of the banking industry.[2] Although the CEEC have made some progress since the deregulation of their banking systems, interest

[1] This chapter appeared as: Claeys, Sophie, and Rudi Vander Vennet, (2003), "Determinants of Bank Interest Margins in Central and Eastern Europe. Convergence to the West?," Ghent University Working Paper 03/203.

[2] See Fries and Taci, 2004; Weill, 2003; Grigorian and Manole, 2002; Yildirim and Philippatos, 2000.

margins remain relatively high and the gap with Western banking markets remains substantial.[3]

However, the interpretation of relatively high interest margins involves a trade-off. On the one hand, high margins are often associated with a low degree of efficiency and non-competitive market conditions. In contrast, high margins may be a reflection of an inadequate regulatory banking environment and a high degree of information asymmetry. In such circumstances, high margins are indicative of high risk premia. If competition increases in this type of environment, it might induce gambling behavior by banks, causing financial instability (Hellman et al., 2000). Beck et al. (2003), for example, conclude that highly concentrated banking systems are less likely to suffer from crises. Therefore, in less developed economies relatively high bank margins may be necessary, at least temporarily, to sustain bank franchise value and avoid financial instability (Gorton and Winton, 1998).

First, we investigate what determines bank interest margins in the CEEC. We analyze whether the relatively high interest margins of banks in transition economies are caused by economic factors, such as an often concentrated market structure and a lack of operational efficiency (structure-conduct-performance versus efficiency), or rather by regulatory factors and underdeveloped banking conditions (business cycle and institutional factors). If high margins are caused by market power or operational inefficiency, stimulating local competition is desirable. If high margins are caused by regulatory underdevelopment and asymmetric information, enterprise and bank reform are a more pressing avenue of public policy. Hence, different causes call for different policy actions.

Second, we examine to what extent bank behavior in the CEEC is similar to that observed in Western Europe. This is especially important for the group of countries that joined the European Union in 2004 but also for those that are expected to enter in the future. These so-called "accession countries" have made considerable efforts to adapt their legal and financial infrastructure to ensure eligibility for EU accession. This process of regulatory and economic harmonization is expected to spur macroeconomic and financial convergence with the EU. In this framework it can also be expected that bank behavior will converge. We systematically compare banks in the new EU members, the other CEEC banks and the banks operating in Western Europe to investigate this hypothesis.

Third, we make reform more explicit and explore how changes in the regula-

[3] See Berglöf and Bolton, 2001 and Riess et al., 2002.

tory framework may capture the differences that still persist between margins in accession, non-accession and Western European banking markets. This enables us to assess whether the recently observed decline in margins can be attributed to improved regulation, whereby lower margins reflect lower risk and hence indicate more financial stability, or to a change in market conditions, whereby low margins are the outcome of increased competition. The empirical analysis covers the years 1994-2001, which coincide with the period following the deregulation of the CEEC banking systems. Hence, we are able to assess the effect of deregulation on interest margins.

In what follows, we use panel data estimation techniques to analyze bank interest margins for 36 countries in Western and Eastern Europe. In section 2 we outline the related literature on the determinants of bank interest margins. Section 3 describes the estimation methodology and the data. Section 4 presents and interprets the main results of the regression analysis. Section 5 concludes and provides a number of policy implications.

4.2 Determinants of bank interest margins

Previous studies analyze bank margins empirically, both for developed and developing countries. One strand of the literature elaborates on the dealership model introduced by Ho and Saunders (1981) who set up a two-step estimation procedure to test their model.[4] Based on this empirical approach, Saunders and Schumacher (2000) find that over the period 1988-95 interest margins in six European countries and the US are affected by the degree of bank capitalization, bank market structure, and the volatility of interest rates. For seven Latin American countries, Brock and Suarez (2000) report that bank spreads in the 1990s are influenced by liquidity and capital risk at the bank level, and by interest rate volatility, inflation and GDP growth at the macroeconomic level, although the results differ across countries. One drawback of the Ho and Saunders approach is that, although bank-specific variables are used to determine pure bank margins, it does not take into account the possible heterogeneity across banks, both within the same market and over different countries. In this paper we deal with bank-specific variation within the same country, as well as across countries and over time.

[4] The first step involves the estimation of a "pure interest spread" by regressing observed margins on a number of bank-specific characteristics. In the second step, the estimated pure spreads are explained by macroeconomic and market structure variables.

An alternative approach found in the literature is a more eclectic single-stage regression technique based on a behavioral model of the banking firm in which various potential determinants of the interest margin are included. Demirgüç-Kunt and Huizinga (1999) use bank-level data for 80 developed and developing countries over the period 1988-95 to analyze the determinants of bank interest margins and bank profitability. Their evidence suggests a role for a large number of indicators next to bank-specific variables, such as macroeconomic conditions, bank taxation, deposit insurance regulation, overall financial structure, and several legal and institutional indicators. Our paper is also related to Demirgüç-Kunt, Laeven and Levine (2004) who assess the impact of bank regulation, bank market concentration and inflation on bank margins, as well as the role of national institutions in regulation and market structure. They use data over the period 1995-99 for a sample of 72 countries. In examining bank regulations, Demirgüç-Kunt et al. (2004) use the database of Barth, Caprio and Levine (2002), which gives an extensive overview of the existing bank regulatory and supervisory rules based on a survey over the period 1998-2000. Notwithstanding its large coverage, the database has the disadvantage that it cannot be used to capture time variation in the legal and institutional environment. Therefore, in their analysis of bank margins, Demirgüç-Kunt et al. (2004) are compelled to look at the averages over the period 1995-99 of concentration and other measures. In this paper, we use the European Bank for Reconstruction and Development (EBRD) indices of bank and enterprise reform as proxies for the regulatory environment. Since the EBRD performs a yearly assessment of regulatory reform we are able to exploit the time-series aspect of these indices. We use a panel structure at the bank level across countries and try to gauge how market structure and market conditions as well as the institutional and regulatory environment affect bank margins. We focus on a sample of transition countries for which we exploit the variation in the institutional environments across these countries and over time.

Finally, our approach is firmly rooted in the industrial organization literature on bank structure and efficiency. In a similar way as has been done for overall bank profitability, the relationship between bank interest margins and market structure can be analyzed within the structure-conduct-performance (SCP) and the efficient-structure (ES) hypotheses. Berger (1995), Goldberg and Rai (1996), and Vander Vennet (2002) consider four different explanations for overall bank profitability that we apply to interest margins. First, the traditional SCP hypothesis asserts that the positive relationship between margins and market structure reflects non-competitive pricing behavior in more concentrated markets. A second theory is the relative-

market-power hypothesis (RMP), which states that only those banks with large market shares are able to exercise market power in pricing and consequently earn higher margins. Alternatively, two efficiency explanations may capture the positive relationship between interest margins and either market concentration or market share (Berger, 1995). The efficient-structure (ES) hypothesis asserts that differences in interest margins are attributable to differences in operational efficiency across banks. The X-efficiency version states that banks with superior management or production technologies have lower costs and subsequently can offer more competitive interest rates on loans and/or deposits, leading to a negative relationship between operational efficiency and interest margins. Since these firms are also assumed to gain larger market shares, the market may become more concentrated as a result of competition. Hence, the correlation between market structure and margins is spurious and runs via higher levels of efficiency. One way to deal with this empirically is to include measures for concentration, market share and operational efficiency simultaneously into the regression. The scale-efficiency version of the ES hypothesis allows that some firms simply produce at a more efficient scale than others, which, under competitive market conditions, will be translated into smaller margins. Again, these firms are assumed to increase their market share, which would lead to higher market concentration.

4.3 Methodology and data

4.3.1 Methodology

We analyze the determinants of bank interest margins in a coherent and encompassing framework in order to assess the importance of micro- and macroeconomic versus regulatory determinants. Our objective is to identify whether the relatively high bank margins observed in the CEEC are primarily driven by market structure and bank-specific factors or whether they are caused by weaknesses in the regulatory framework in which the banks operate. We extend Berger (1995), Goldberg and Rai (1996) and Vander Vennet (2002) and include four types of variables in our regressions: (1) country-specific bank market characteristics, such as the degree of concentration, (2) country-specific macroeconomic conditions, such as inflation, real economic growth and the real short term interest rate, (3) bank-specific characteristics, such as the degree of operational efficiency, capital adequacy, market share, the proportion of loans in total assets and the proportion of demand and savings deposits in total deposits and (4) regulatory features, such as the (time-varying)

degree of bank and enterprise reform in the CEEC. We first estimate equations of the following form for both the CEEC and Western European banks:

$$\begin{aligned} NIM_{i,j,t} = {} & \alpha_0 + \alpha_1 \cdot CONC_{j,t} + \alpha_2 \cdot MS_{i,j,t} + \alpha_3 \cdot SIZE_{i,j,t} + \alpha_4 \cdot EFF_{i,j,t} \\ & + \alpha_5 \cdot CAP_{i,j,t} + \alpha_6 \cdot LTA_{i,j,t} + \alpha_7 \cdot DSDEP_{i,j,t} \\ & + \alpha_8 \cdot GDP\ Growth_{j,t} + \alpha_9 \cdot Inflation_{j,t} + \alpha_{10} \cdot Interest\ Rate_{j,t} \\ & + CFE_j + TFE_t + \epsilon_{i,j,t}, \end{aligned} \tag{4.1}$$

with $NIM_{i,j,t}$ the net interest margin of bank i in country j at time t. The NIM is calculated as the difference between interest income and interest expenses as a proportion of total earning assets.[5] The first four explanatory variables are included to test the relative importance of the SCP and efficiency explanations. $CONC_{j,t}$ is either the Herfindahl measure of market concentration, calculated as the sum of squared market shares in the loan market $HERF_{j,t} = \sum_{i=1}^{n_j} \left[(MS_{i,j,t}^{loans})^2 \right]$, or a concentration ratio $CR_{j,t}$, calculated as the percentage of loans granted by the largest bank in the country. Based on the structure-conduct-performance argument, a positive impact of concentration on bank interest margins would be indicative of collusion. $MS_{i,j,t}$ is a measure of relative market power and is calculated as bank i's share of assets at time t in country j's total bank assets at time t. A positive sign would support the relative-market-power hypothesis, i.e. banks with a relatively high market share are more able to set prices autonomously. The efficiency ratio $EFF_{i,j,t}$ is calculated as the inverse of total overhead costs to total assets.[6] The efficient-structure hypothesis predicts a negative relationship between interest margins and efficiency. We try to capture any scale-related cost or revenue advantages by including $SIZE_{i,j,t}$, calculated as the share of total assets of bank i in country j at time t to the assets of the median bank in country j at time t.[7] Goldberg and Rai

[5] Laeven and Majnoni (2003) discuss the use of balance sheet data to construct a proxy for the intermediation margin. An unbiased measure of the pure intermediation margin would be the difference between (actual) lending revenues and deposit costs for each bank, but these data are not available for the majority of banks in our sample. Our construction of the interest margin implicitly assumes that the other interest income (e.g. on securities) and interest expenses (e.g. on interbank borrowings) reflect competitive market conditions across the banks in the sample.

[6] The cost/assets ratio indicates how much operational costs the bank incurs by managing a given level of assets. We prefer this variable over the commonly used cost/income ratio because the latter contains the net interest margin, the dependent variable we attempt to explain. Moreover, total income also includes non-interest income, which tends to be very volatile and is often unrelated to the core financial intermediation business of banks.

[7] Since most banks in the CEEC are relatively small compared to Western European banks we do not use the log of assets to proxy for size, but take a size measure relative to that of the median

(1996) fail to find a positive relationship between concentration and profitability and find weak support for the efficient-structure hypothesis for a sample of large banks located in 11 European countries for the period 1988-91. These findings are corroborated by those reported in Vander Vennet (2002) for European banks in the 1990s. For European banking markets Maudos and de Guevara (2004) find a statistically significant positive correlation between concentration and bank interest margins for the period 1993-2000. Corvoisier and Gropp (2002) find that higher concentration may have resulted in less competitive pricing by banks located in the euro area for the period 1993-1999.

Next, we include three bank-specific control variables that have been shown to be instrumental in explaining bank interest margins (Saunders and Schumacher, 2000; Brock and Suarez, 2000). A first variable is the degree of bank capital adequacy, captured by $CAP_{i,j,t}$, the ratio of equity to total assets. When a bank holds excess capital above the regulatory minimum[8], two positive effects on the interest margin can be distinguished. First, since the bank has free capital it has the possibility to increase its portfolio of risky assets in the form of loans or securities. When market conditions allow the bank to make additional loans with a beneficial return/risk profile, this will, ceteris paribus, increase their interest margin. Second, since capital is considered to be the most expensive form of liabilities in terms of expected return, holding capital above the regulatory minimum is a credible signal of creditworthiness on the part of the bank. When depositors exert "depositor market discipline", this may enable the bank to lower its deposit funding costs and, hence, increase its interest margin. Empirical evidence of depositor discipline is reported by Goldberg and Hudgins (2002) and by Park and Peristiani (1998) for the case of US savings and loan associations. Martinez Peria and Schmukler (1999) find evidence that market discipline also exists in developing countries, even in the presence of deposit insurance. In the CEEC, depositors have few alternatives for bank deposits; yet they are regularly confronted with information about bad asset quality in some banks and even outright bank failures. This feature will induce depositors, especially professional market participants, to act prudently and avoid depositing money in badly capitalized banks. Another well known feature is that depositors switch to supposedly safe banks in times of financial crises. Hence, we use the degree of capitalization as a proxy for all types of arrangements that cause depositors to

bank in the country.

[8] In principle, all banks in our sample are subject to BIS-type capital adequacy regulations; all banks are required to hold at least 8% of capital against their risky assets. In some CEEC, capital regulations have been more stringent (see Barth et al. 2002).

regard certain banks as "safer". We therefore expect that a higher degree of capital coverage will be associated with higher interest margins.

We include two indicators of the banks' balance sheet composition in the regressions. The first is the proportion of total loans in total assets, $LTA_{i,j,t}$. We expect that a high LTA will be associated with higher interest margins due to risk and cost considerations. A higher LTA should increase revenues since loans are the most risky and, hence, the highest-yielding (in terms of expected return) type of assets. Consequently, LTA is intended to capture the bank's asset risk.[9] Loans are also the type of assets with the highest operational costs because they need to be originated, serviced and monitored. When the bank applies markup pricing for its lending rates, the interest margin will increase. The second balance sheet indicator is the proportion of demand and savings deposits in total deposits, $DSDEP_{i,j,t}$ (Berlin and Mester, 1999). Demand and savings deposits are usually relatively stable and cheap compared to borrowed funds. Hence, a bank with substantial access to this source of funding through a solid local deposit market penetration should be able to maintain high interest margins.

In order to control for the macroeconomic environment in which the banks operate, we include real GDP growth to proxy for business cycle fluctuations, the inflation rate, calculated as the (end of year) change in CPI, and the real short term interest rate. Boyd et al. (2001) find evidence of a strong negative correlation between inflation and the amount of bank lending. This suggests that bank margins will decrease as inflation is lower. The short term interest rate is included to capture the stance of monetary policy.

Finally, all the estimated equations include year and country fixed effects (CFE and TFE) and allow for bank-specific unobserved heterogeneity ($\epsilon_{i,j,t}$). Country dummies are expected to capture country-related effects such as differences in legislation, accounting standards and tax structures, that are only imperfectly measurable.

In a next step, we analyze how country-specific regulatory features impact margins in the CEEC more explicitly. To assess how the changes in regulation of the last decade have affected bank margins in the CEEC, we include variables related to regulatory reform in the CEEC. We incorporate two EBRD reform indices that

[9] A more appropriate measure for risk would be a non-performing loans ratio. Due to data limitations, no homogeneous proxy could be constructed for all banks.

vary across countries and over time: the transition indicator for enterprise reform, $EBRDetp_{j,t}$ and the transition indicator for banking reform, $EBRDbank_{j,t}$. These EBRD indices provide a ranking of the liberalization progress and institutional reform in the corporate and banking sector respectively. More detailed definitions of the indices are provided in table 4.10 in appendix 4.A. When we average the EBRD indices per country over the years in our sample, we find that they are closely related to the regulatory and institutional indicators used by Demirgüç-Kunt et al. (2004).[10] Not unexpectedly, this confirms that the EBRD indices accurately reflect the degree of regulatory and institutional reform. Moreover, both indicators vary over time and provide a ranking between 1 and 4, where 4 represents a level of reform that approximates the institutional standards of an industrialized market economy.[11] This enables us to analyze how changes over time in institutional reform affect bank behavior. Fries et al. (2002) use these measures to classify 16 transition economies into a high reform and a low reform sample and subsequently investigate bank performance for these two groups. We investigate how reforms have affected the NIM next to the SCP and ES explanations and analyze how reforms may account for observed differences with Western Europe. We therefore estimate a second set of regressions of the following form:

$$
\begin{aligned}
NIM_{i,j,t} \;=\; & (4.1) + \alpha_{11} \cdot EBRDetp_{j,t} && \text{(4.2a)}\\
& (4.1) + \alpha_{11} \cdot EBRDbank_{j,t} && \text{(4.2b)}\\
& (4.1) + \alpha_{11} \cdot X * EBRDetp_{j,t} && \text{(4.2c)}\\
& (4.1) + \alpha_{11} \cdot X * EBRDbank_{j,t}. && \text{(4.2d)}
\end{aligned}
$$

We first introduce the EBRD indices directly in our equations (4.2a and 4.2b). Alternatively, we interact them with variables that reflect bank behavior to assess how different levels of institutional reform affect the sensitivity of the NIM with respect to these variables (4.2c and 4.2d).

In the empirical analysis we exploit three dimensions of the data: time variation, cross-country variation and bank-specific variation. All the estimations are

[10] Both $EBRDetp$ and $EBRDbank$ are positively correlated with the "economic freedom", "property rights" and "KKZ institution index" variables. The $EBRDbank$ indicator is also positively correlated with "banking freedom" and "foreign ownership" and negatively correlated with the "fraction entry denied", "reserve requirements" and "state ownership" variables defined in Demirgüç-Kunt et al. (2004).

[11] As expected, for most countries both indicators increase over time, although temporary decreases occur, e.g. in Slovakia, Latvia and Lithuania.

performed using a random effects panel data estimator, i.e. we assume that some unobserved heterogeneity between banks exists that is not correlated with the other explanatory variables.[12]

4.3.2 Data sources

We use a sample of 2279 banks from 36 Western and Eastern European countries over the years 1994-2001.[13] All bank balance sheet data and income statements are obtained from the *BankScope* database maintained by Fitch/IBCA/Bureau Van Dijk. Since we focus on bank intermediation, we use unconsolidated statements whenever possible, although in some cases we have to rely on consolidated statements because of data unavailability. The institutional bank types included are commercial banks, savings banks and cooperative banks, since these types of banks are primarily engaged in financial intermediation.[14] To make sure that we do not omit any banks that are important players in the deposit and/or loan markets, we also include medium- and long-term credit banks and specialized government institutions, because they remain important in certain countries. All other types of banks, such as development banks, central or investment banks are excluded. Merged banks are considered as separate entities before the merger and as one entity afterwards. All the ratios capturing bank-specific characteristics are calculated based on the standardized global accounting format provided by *BankScope* in order to ensure comparability across countries. Data on inflation, GDP growth and the short term interest rate are taken from the IMF International Financial Statistics. The bank and enterprise reform indicators are obtained from various EBRD Transition Reports. The final dataset consists of an unbalanced panel with more than 16000 observations. Although *BankScope* is one of the most commonly used databases when dealing with bank characteristics, its coverage differs across countries, especially for the Eastern European countries. However, in all countries, the available banks account for a very large proportion (usually more than 80%) of the deposit and lending activity, on which this paper is focused (see Demirgüç-Kunt and Huizinga, 1999; Cunningham, 2001; Demirgüç-Kunt et al., 2004). Table 4.1 reports the number of banks available in each of the countries and provides evidence on their size distribution.

[12] We do not assume unobserved heterogeneity on the country level, since we want to account for unobserved bank-specific effects such as bank specialisation and ownership structure, for which we do not have homogeneous information that covers all banks in our sample.

[13] The countries included in our sample are listed in the Appendix.

[14] For Germany we excluded the "Sparkassen". Because of their large number and different institutional character, inclusion of the German savings banks could bias the sample.

4.3.3 Summary statistics

Table 4.2 reports the summary statistics of the variables that we use in the empirical analysis. All observations more than two standard errors away from the country mean are deleted. On average, net interest margins in Western Europe are lower (2.9%) than in the accession countries (4.7%) and in the non-accession countries (8%). Moreover, margins are much more volatile when moving from Western to Eastern Europe. The Herfindahl index (on a scale between 0 and 1) in the CEEC sample is on average twice as large as the index in the West. The efficiency measure exhibits lower values on average for the accession and non-accession countries compared to Western Europe. Further, banking markets in the CEEC, especially in the non-accession countries, are characterized by higher and more volatile levels of inflation and GDP growth.[15]

4.4 Regression results

4.4.1 Determinants of bank margins

Tables 4.3, 4.4 and 4.5 report the regression results for the sample of Western European, accession and non-accession countries. We first report the estimation results when only including measures for concentration, market share, operational efficiency and scale efficiency in order to test the relative importance of the SCP and the ES hypotheses. In the following set of regressions we then include the bank-specific control variables CAP, $DSDEP$, LTA and consecutively control for the macroeconomic environment by adding real GDP growth, inflation and the interest rate.[16] Table 4.6 summarizes the average economic impact of the explanatory variables for the different subsamples.

[15] The correlation matrices for the different variables indicate that the variables of interest show a significant correlation with the net interest margin. Some of the correlations between the variables are relatively high and might cause collinearity problems in the regression analysis. For example, in all subsamples the Herfindahl index is highly correlated with market share and inflation. To assess the collinearity problem this might cause, we estimate all regressions twice using either the Herfindahl index or the concentration ratio. Correlations do not dissapear when using CR, but go down in many cases. All subsamples further display a high correlation between market share and size. We therefore estimate all equations separately for MS and $SIZE$ to avoid collinearity. To analyze the effect of other correlations (e.g. high correlation between inflation, gdp growth and the interest rate) we perform some additional regressions as robustness checks. The correlation matrices are available upon request.

[16] The coefficients of the time and country dummies have been omitted from the regression output but are available upon request.

4.4.2 A comparison with the West

In table 4.7 we analyze whether the determinants of bank interest margins in the accession countries that joined the European Union in 2004 behave similarly to those in Western Europe and whether they show significant differences with the group of CEEC that have not joined the EU yet. To test this, we interact the determinants with regional dummy variables that equal one for banks operating in either accession or non-accession countries. The results indicate that indeed many determinants of the NIM have a more (less) pronounced effect in the CEEC compared with the Western European countries. We discuss these results in more detail in the following paragraphs.

4.4.3 General results

The estimation results for the Western European sample (table 4.3) lend support to the SCP hypothesis: both coefficients on $HERF$ and CR are positive and highly significant in all regressions.[17] A one standard deviation rise in market concentration increases bank margins with 10 basis points, on average (see table 4.6). This suggests that banks in Western Europe were able to exploit a more concentrated market structure. When turning to the CEEC samples, no clear results on concentration effects emerge and most coefficients become negative when controlling for macroeconomic variables (tables 4.4 and 4.5). These findings seem unexpected since it is usually assumed that Western European banking markets are competitive, due to the extensive efforts made in financial deregulation and regulatory harmonization.[18] However, our findings only corroborate previous results. De Bandt and Davis (2000) conclude that European banking markets were characterized by monopolistic competition before EMU, while Corvoisier and Gropp (2002) find that for loans and demand deposits, increased concentration due to consolidation in European banking may have resulted in less competitive pricing by banks. For a sample of six European countries and the US, Saunders and Schumacher (2000) also find evidence of a non-competitive market structure which materializes in an extra rent above the pure intermediation spread. The negative and significant coefficient for $SIZE$ however suggests that the ongoing consolidation process in Western Euro-

[17] When we control for macroeconomic variables, the coefficient becomes somewhat smaller. Demirgüç-Kunt et al. (2004) find that once they control for regulatory change, the positive relation between the Herfindahl index and margins breaks down. The country dummies and macro variables capture part of these institutional elements.

[18] Milestones in the bank market integration process are the Second Banking Directive (1989), the Single Market Program (1993), the harmonization of capital adequacy rules through various directives, and the introduction of the euro (1999).

pean banking may generate scale-related cost advantages that reduce margins. For the CEEC subsamples, our results contradict Gondat-Larralde and Lepetit (2001), who find a positive relationship between market concentration of banks and their performance for a sample of eight CEEC over the period 1992-96.

One explanation for the negative concentration effect found in the CEEC subsamples can be the high concentration of foreign banks, which exhibit lower interest margins (Martinez Peria and Mody, 2004). In many CEEC, entry of foreign banks has played an important role in the bank reform process by increasing levels of efficiency (see e.g. Claessens et al., 2001 and Bonin et al., 2005). Since we do not have comprehensive bank-ownership data that is comparable across countries and accounts for ownership changes over time, we were unable to test formally for the effect of foreign ownership on bank margins in both Western and Eastern Europe. In chapter 5, we look into the ownership structure of foreign banks in 10 CEEC.

To assess how ownership structure may have impacted the NIM, we performed some extra regressions in which we control for the number of foreign banks and the asset share of state-owned banks on the country-level, taken from the EBRD Transition Reports. Our results indicate that a large asset share of state-owned banks partially explains the negative sign for concentration in non-accession countries, while in the accession countries a relatively large number of foreign banks seems responsible for the negative concentration effect.[19]

The relative-market-share hypothesis (RMP) does not receive much support in the Western European sample. The coefficient on MS becomes insignificant when we control for bank-specific and macroeconomic variables. For the non-accession regressions we find some evidence in favour of the RMP hypothesis (last columns of table 4.5). A one standard deviation increase in market share results in a 74 basis points higher interest margin, which indicates that large banks in these markets can exert some degree of market power (see table 4.6). The coefficient for the efficiency ratio enters the equations negatively and is highly significant in most regressions, supporting the efficient-structure hypothesis. For a sample of 5 transition economies, Gondat-Larralde and Lepetit (2001) find that higher levels of efficiency improve bank profitability. Our result is in line with Vander Vennet (2002) who finds that higher efficiency reduces interest margins significantly in a sample of Western European countries. In accordance with theory, a higher operational efficiency induces banks

[19] This seems to be is in line with Sapienza (2002) who finds evidence that state-owned banks charge lower interest rates, especially to firms located in regions with strong political clout.

to pass the lower costs on to their customers in the form of lower loan rates and/or higher deposit rates, thereby lowering the interest margin. The finding that MS is insignificant implies that this behavior holds for all banks, also for the largest ones. Table 4.7 indicates that the efficiency effect is significantly larger in the CEEC than in the West (significant negative interaction terms $EFF * Reg$). This means that efficiency gains in the accession countries are passed on to the banks' customers. The estimates for the subsamples indicate that the efficiency effect is present in all samples, but not (yet) in the non-accession banking sectors (table 4.5). In the non-accession countries the efficiency effect disappears when we control for bank-specific and macroeconomic variables.[20]

4.4.4 Bank-specific and macroeconomic conditions

We now consider the bank-specific and macroeconomic control variables. A noteworthy feature is the role of bank capital. The capital-to-assets ratio enters all regressions positively and is strongly significant (see also Brock and Suarez, 2000; Saunders and Schumacher, 2000 and Demirgüç-Kunt et al., 2004). This finding is consistent with the interpretation that capital serves as a signal of the banks' creditworthiness in both the Western European and CEEC banking markets. In the non-accession banking markets, however, the capital ratio has a coefficient at least twice as large as the one reported for Western European banks. Table 4.7 reveals that this difference is statistically significant. An increase of one standard deviation of the capital-to-assets ratio adds, on average, 0.39 percent to the NIM in Western European banking markets compared to 0.63 and 1.49 percent in accession and non-accession countries (see table 4.6). The higher sensitivity of margins with respect to CAP can be explained by the existence of depositor discipline in transition banking. This may decrease the deposit cost of well capitalized banks, leading to higher interest margins. The extra effect in non-accession countries is systematically higher compared to the accession countries (see the coefficient on $CAP * Reg$ in table 4.7). This indicates that in an environment characterized by lower levels of reform (see the summary statistics for the non-accession countries in table 4.2), depositor discipline is even stronger. Holding capital in excess of what is required is then often the only solution to signal solvency and inspire depositor trust. Once the legal environment improves (in accession countries), depositor confidence grows and the "credible amount" of capital needed to signal creditworthiness can be reduced. The

[20] The high correlations between efficiency and the other explanatory variables might be an issue of concern. However, when we re-estimate the equations without EFF, the results with respect to the other variables remain unaltered.

findings for Western and Eastern European countries combined illustrate the importance of capital adequacy rules as an instrument of prudential supervision. Sufficient capital buffers are necessary to maintain the stability of the banking system. Moreover, banks with sufficient capital can not only expand their deposit base, but are also able to use these funds to increase their lending to borrowers with varying risk profiles. This should ultimately stimulate economic growth.

The LTA ratio has a positive and significant effect on the NIM, albeit more pronounced in the CEEC banking markets. Since loans are the most risky and cost-intensive asset class, this finding supports the hypothesis that more lending results in wider margins and reflects the banks' ability to integrate risk and cost considerations in their loan pricing behavior. The fact that the coefficient is much larger and statistically different in the CEEC (see table 4.7) indicates that a substantial part of the interest margin in transition banking can be considered as a compensation for risk taking. The estimated coefficient for the variable capturing the deposit composition of bank funding ($DSDEP$) is positive and significant for Western Europe and the accession countries. This indicates that having access to a stable and relatively cheap source of deposit funding translates into a distinct advantage in terms of realized interest margins. This is not yet the case for the non-accession banking markets, where customer savings are often still concentrated at (former) state-owned banks.[21]

The NIM significantly depends on the prevailing business cycle conditions. The positive association between the business cycle and bank margins is mainly a characteristic of the Western European banking markets. For these markets, higher economic growth is associated with higher margins, as a reflection of more lending and lower default rates. In the CEEC no such relationship is found; the coefficient on economic growth is negative or insignificant. This can be explained by the relatively high volatility of the business cycle in transition economies, where periods of economic growth have sometimes been interrupted by periods of crisis. The positive coefficient on inflation supports the hypothesis that lower inflation (and decreasing inflation expectations) have a more pronounced downward effect on long-term compared to short-term interest rates, leading to declining intermediation margins.

From the previous sections we conclude that the SCP hypothesis cannot be rejected in Western Europe. This corroborates previous results for European banking.

[21] In the early years of transition, former savings banks were the most important collectors of deposits, which they transferred to the credit-granting banks through the money market (Dittus and Prowse, 1995).

In the CEEC, however, the results indicate that increased concentration resulted in a lower NIM. In the accession countries, bank interest margins are primarily determined by operational efficiency rather than market structure, while in non-accession countries, large banks still succeed in maintaining high interest margins. In both the CEEC and Western Europe, NIMs are most sensitive to changes in capital adequacy (CAP) and lending behavior (LTA) (see table 4.6). The sensitivity is the highest in the non-accession countries and gradually goes down when moving to more developed banking markets.

4.4.5 Regulatory and institutional properties

We now analyze how institutional reforms in the bank and corporate sector affect CEEC bank margins and its determinants and whether they can partially explain the observed differences with the Western European markets. The results are shown in tables 4.8 and 4.9 for accession and non-accession countries.[22] When entered directly into the equation, the EBRD reform indices have a significantly positive impact on the NIM, but only for non-accession countries. More bank reform ($EBRDbank$) is expected to induce sound banking, which in turn will spur lending. The EBRD index on enterprise reform ($EBRDetp$) is significantly positive for the non-accession banking markets, indicating that as asymmetric information problems decline, banks are more willing to grant more loans (since they can better identify good from bad borrowers), which leads to higher margins and profitability. This finding stresses the prime importance of policy measures to diminish the asymmetric information problems associated with adverse selection and moral hazard in transition banking.

Next, we interact the bank-specific variables CAP and LTA with the two reform indices to investigate how institutional reforms affect their sensitivity with respect to the NIM. This allows us to test wether reforms put bank behavior and bank margins more on a Western European track. Because of the high correlations between the EBRD indices and the other variables, we introduce the interaction terms one by one in the regressions (see tables 4.8 and 4.9). The results indicate that in accession countries, higher levels of enterprise reform reduce the sensitivity of both CAP and LTA with respect to the NIM. In these banking markets, the NIM reacts less to changes in capital adequacy or LTA when firms become more efficient and asymmetric information problems decline. Changes in the capital ratio then serve less as a signalling device but rather reflect normal risk adjustments. This

[22] We only report the results that include the Herfindahl index and exclude the size variable. The results with CR and $SIZE$ are very similar and are available upon request.

effect is not (yet) present in the non-accession countries. In the non-accession countries, the interaction terms with LTA enter the equation positively, while in the accession countries these interaction terms enter negatively or become insignificant. This indicates that in the accession countries it becomes more difficult for banks to maintain high lending rates once the corporate sector becomes more competitive and transparent. This does not necessarily imply that banks take more risk. Fries et al. (2002) find that in countries with a significant progress in bank and enterprise reform, there is no evidence of excessive risk-taking behavior by banks. The interaction term of LTA with the reform variables may capture part of the shift in the loan portfolio towards more risky projects or the effects of increased competition. We find that for lower levels of institutional reform (non-accession countries) more reform increases bank risk behavior (positive sign on the interaction term) while for more advanced levels of reform (accession countries) competition in the credit sector has a downward effect on margins. In the non-accession countries the overall level of bank and enterprise reform is lower so that the interaction with the LTA and EBRD variables probably captures the shift in the loan portfolio towards more risky and high-return loans. This shift will increase the interest margin.

4.4.6 Robustness

To test whether our results are robust to the estimation technique that we employ, we carry out a set of robustness checks.[23] One set of checks is related to the inclusion of country dummies. When leaving these out we can either 1) estimate the equations assuming unobserved heterogeneity on the country level (under the assumption of Random (RE) or Fixed Effects (FE)) or 2) estimate the equations assuming unobserved heterogeneity on the bank level (under the assumption of RE or FE), for which the macroeconomic variables and the concentration ratio should then suffice to account for country-specific effects. When performing these four sets of regressions for the different subsamples, we find that for the regressions with unobserved bank heterogeneity all results with respect to concentration, RMP and efficiency are confirmed. The scale-related effects found for Western European banks are not robust for the bank-specific FE representation. All other conclusions remain valid. When assuming unobserved country heterogeneity the coefficients for $HERF$ and MS change for the Western European subsample. This means that $HERF$ partially captures some of the country-specific unobserved effects such as differences in legislation, accounting standards and tax structures. For the accession countries, we find

[23] These results are reported in the appendix of Claeys and Vander Vennet (2003).

some evidence of an RMP effect. All other coefficients remain qualitatively similar. For the non-accession sample the coefficients of EFF and $SIZE$ become unstable; the results for CAP and LTA remain valid.

A second check is related to the inclusion of time dummies. We accounted for time effects by including time dummies. However, these might not fully account for the changes that occurred during the 1990s. When we perform cross-country regressions per individual year, we observe changes in coefficient size and sign for MS and $HERF$, which suggests that the changing environment in the banking sector during the 1990s has affected margins dissimilarly over different years. The results for the Western European sample indicate that in the beginning of our sample, concentration had a positive impact on margins. From 1998 onwards, the positive relation between concentration and margins disappears. This could be due to the introduction of the euro, which should have brought more competition and contestability in the Western European banking markets. For the CEEC subsamples the results confirm that EFF, CAP and inflation are the most important determinants of the NIM across time.

A third check assesses the effect of the correlations between the macroeconomic variables and $HERF$. When we alternatively include GDP growth, inflation and the interest rate in the equation, we find that the results for the different hypotheses (SCP, RMP and ES) are largely corroborated. The concentration results in Western Europe remain valid. In the CEEC, no clear pattern on collusive behavior emerges. There still remains only weak evidence for the RMP hypothesis in the CEEC. Size and significance of the bank-specific variables remain unaltered in all but one regression over all subsamples. Size and significance of the macroeconomic variables may change depending on the specification used. The positive inflation effect remains valid in all estimations and even emerges for the non-accession regressions when leaving out the interest rate or GDP growth.

4.5 Concluding remarks

In this chapter we pursue two goals. First, we investigate the determinants of bank interest margins in Central and Eastern European countries. We assess to what extent the relatively high margins of banks in transition economies can be attributed to a low degree of efficiency and non-competitive market conditions (efficiency versus structure-conduct-performance), or to changes in the regulatory environment in which the banks operate (business cycle and institutional factors). Second, we provide a systematic comparative analysis of the determinants of interest margins

of CEEC banks versus banks operating in Western European economies. This enables us to assess to what extent the determinants of interest margins in the CEEC are similar to those found in Western European banking markets. Furthermore, we assess whether institutional reform, proxied by the EBRD indices of bank and enterprise reform, has affected the determinants of bank interest margins in the CEEC and can help explain some of the observed differences with the West. We produce separate results for the group of accession countries that joined the EU in 2004. Our main findings can be summarized as follows. The structure-conduct-performance (SCP) hypothesis cannot be rejected in the Western European banking markets, whereas we do not find evidence supporting the concentration hypothesis in the CEEC. Higher operational efficiency is reflected in lower bank interest margins in both Western European and accession countries, but not (yet) in the non-accession banking markets. Hence, the efficient-structure hypothesis is only corroborated in the more developed banking markets. Capital adequacy is an important determinant of bank margins, both in developed and transition banking markets. But the positive effect of capital adequacy on bank margins is at least twice as large in the transition countries. The pricing of lending risk plays an important role in explaining high interest margins in the CEEC. However, as reform in the corporate sector proceeds, better screening and monitoring and increased competition tend to erode interest margins.

In general we only find weak evidence in favor of the structure-conduct-performance or relative-market-share hypothesis hypotheses in the Eastern European banking markets, while efficiency effects show up significantly and are comparable to the West, especially in the accession countries. The finding that interest margins are not so much determined by bank market structure is probably a reflection of the rapid development of bank lending in transition economies and increased competition following the entry of foreign banks. The evidence supporting the efficient-structure hypothesis is good news for depositors and borrowers, since the improvement of operational bank efficiency is, at least partly, passed on to the customers. Capital turns out to be an important determinant of bank margins, both in Western European countries and the CEEC. We interpret this finding as evidence of the disciplining role of capital, but the quantitative effect is much larger in the CEEC. Our results also stress the importance of binding capital adequacy rules as a means to prevent banks from taking excessive risks and as a tool for maintaining depositor confidence. Combined, these results indicate that banking in the transition economies of the CEEC is on a virtuous path: increasing efficiency benefits customers, while capital

adequacy ensures systemic stability. In the absence of banking crises, this type of banking environment should stimulate economic growth.

We further find that reform in the regulatory and institutional environment may initially increase the net interest margin sensitivity with respect to risk behavior in a situation of underdeveloped banking conditions (non-accession countries). However, for more advanced countries (accession countries), competition effects in lending tend to lower interest margins. We also find that banks can hold lower levels of capital and still maintain depositor confidence in countries with a higher degree of institutional reform (accession versus non-accession countries). Our results imply that the behavior of banks in Central and Eastern Europe gradually converges to the one observed for their Western European counterparts. As the quality of bank and enterprise reform progresses, this finding becomes more pronounced. Hence, the policy implication is that regulators and financial supervisors in transition economies should foster reform in the corporate sector in order to reduce asymmetric information. Consequently, banks will be able and more willing to screen, lend and monitor, which will lead to increased credit availability. If a sufficient degree of competition in the banking markets can be maintained, interest margins will probably converge to Western European levels.

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4.A Tables

TABLE 4.1

Average number of banks per country (1994-2001) and distribution of assets

country	No. of banks (average)	mean(assets)	sd(assets)	p25(assets)	p75(assets)
Albania	3	160,0	329,0	24,1	109,3
Austria	112	2128,6	5783,8	176,4	1108,8
Belarus	8	258,4	284,2	41,5	346,6
Belgium	51	5271,5	18976,0	209,4	2051,4
Bosnia	9	57,2	59,6	20,3	71,1
Bulgaria	17	193,9	283,8	32,7	215,6
Croatia	34	290,4	551,7	48,2	258,0
Czech	18	2557,0	4108,9	312,1	1707,6
Denmark	81	636,4	1890,4	78,0	432,2
Estonia	4	788,0	1040,9	116,8	987,6
Finland	5	22315,4	41677,3	1598,0	24903,7
France	294	5568,7	17783,5	413,0	4317,2
Germany	188	8349,4	23036,2	232,3	3099,0
Greece	11	6868,6	10262,0	382,8	10316,6
Hungary	22	949,3	1403,2	191,9	1226,7
Iceland	6	990,3	992,5	268,9	1340,9
Ireland	27	5869,5	10741,3	1108,7	4282,9
Italy	304	2451,9	6297,5	172,0	1807,7
Latvia	16	150,7	211,5	33,3	165,8
Lithuania	7	240,9	364,8	32,4	310,8
Luxembourg	89	3886,2	6624,9	384,5	4164,3
Macedonia	9	102,9	144,9	19,4	108,9
Netherlands	37	6809,0	19859,2	490,2	4711,8
Norway	34	2496,7	4889,8	334,3	2179,2
Poland	30	1642,4	3165,3	144,4	1490,7
Portugal	21	5276,4	9304,1	536,2	4711,3
Romania	12	277,7	473,4	36,0	338,8
Russia	54	398,0	810,4	39,1	309,3
Slovakia	14	926,6	1299,2	167,5	777,0
Slovenia	16	648,1	913,7	144,1	757,5
Spain	131	3835,7	7730,0	338,4	3923,9
Sweden	14	16472,7	22982,8	1257,5	34143,4
Switzerland	217	1738,4	7160,4	95,9	792,7
United Kingdom	100	9332,4	28210,8	234,5	3774,1
Ukraine	20	136,3	200,4	23,1	131,9
Yugoslavia	8	246,6	255,2	47,3	267,0

Note: Data taken from Bankscope. All variables are averaged over the years 1994-2001 and are expressed in million euro.

TABLE 4.2

Summary Statistics

	Western Europe			Accession Countries			Non-Accession Countries		
Variable	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.
Net Interest Margin	10102	2.88	1.87	619	4.72	3.4	1033	8.02	8.84
Herfindahl Index	10102	0.09	0.07	619	0.17	0.07	1033	0.19	0.12
Concentration Ratio	10102	0.19	0.1	619	0.31	0.08	1033	0.35	0.14
Market Share	10102	0.01	0.03	619	0.06	0.09	1033	0.04	0.09
Size	10102	407	1147	619	230	311	1033	235	461
Efficiency	10102	0.61	0.88	619	0.34	0.34	1032	0.2	0.18
Capital to Assets	10102	9.14	6.42	619	11.13	6.5	1033	19.64	11.58
Loans to Assets	10102	51.82	23.78	619	42.66	16.02	1033	40.72	16.97
Dem. and Sav. Deposits	10096	63.45	31.33	503	43.25	24.83	390	73.26	25.34
GDP Growth	10102	2.45	1.43	619	4.03	2.59	1033	2.39	8.47
Inflation	10102	1.92	1.09	619	10.36	7.41	1030	51.47	91.19
Interest Rate	10102	2.58	1.27	603	3.53	5.61	919	-16.39	74.24
EBRDetp				619	2.9	0.27	1033	2	0.45
EBRDbank				619	3.13	0.33	1033	2.19	0.62

Note: Detailed information on country classification, definitions and sources of variables is available in the Appendix.

TABLE 4.3

Panel Estimations for Bank Margins for the Sample of Western European Banks

	SCP versus EFF				bank-specific controls				macro-economic controls			
Variables												
HERF	2.0329***	1.9828***			2.3435***	2.3116***			1.3809***	1.3672***		
	[0.3121]	[0.3118]			[0.3084]	[0.3083]			[0.3071]	[0.3071]		
CR			1.3494***	1.3246***			1.5148***	1.4990***			0.9244***	0.9183***
			[0.1793]	[0.1792]			[0.1772]	[0.1771]			[0.1771]	[0.1770]
MS	-1.5658***		-1.5276**		-1.1508*		-1.1088*		-0.6993		-0.6816	
	[0.6046]		[0.6041]		[0.5920]		[0.5915]		[0.5815]		[0.5813]	
SIZE		-0.0001***		-0.0001***		-0.0001***		-0.0001***		-0.0001***		-0.0001***
		[0.0000]		[0.0000]		[0.0000]		[0.0000]		[0.0000]		[0.0000]
EFF	-0.3275***	-0.3054***	-0.3261***	-0.3040***	-0.2386***	-0.2264***	-0.2371***	-0.2250***	-0.2269***	-0.2173***	-0.2258***	-0.2162***
	[0.0232]	[0.0234]	[0.0232]	[0.0234]	[0.0226]	[0.0228]	[0.0226]	[0.0227]	[0.0223]	[0.0224]	[0.0223]	[0.0224]
CAP					0.0592***	0.0580***	0.0594***	0.0581***	0.0605***	0.0595***	0.0606***	0.0596***
					[0.0028]	[0.0028]	[0.0028]	[0.0028]	[0.0028]	[0.0028]	[0.0028]	[0.0028]
LTA					0.0123***	0.0122***	0.0122***	0.0121***	0.0155***	0.0155***	0.0155***	0.0154***
					[0.0009]	[0.0009]	[0.0009]	[0.0009]	[0.0009]	[0.0009]	[0.0009]	[0.0009]
DSDEP					0.0026***	0.0025***	0.0026***	0.0024***	0.0031***	0.0029***	0.0030***	0.0029***
					[0.0007]	[0.0007]	[0.0007]	[0.0007]	[0.0006]	[0.0007]	[0.0006]	[0.0007]
GDP Growth									0.0728***	0.0709***	0.0715***	0.0695***
									[0.0096]	[0.0096]	[0.0096]	[0.0096]
Inflation									0.1539***	0.1535***	0.1514***	0.1510***
									[0.0139]	[0.0138]	[0.0139]	[0.0139]
Interest Rate									0.1372***	0.1367***	0.1369***	0.1364***
									[0.0096]	[0.0096]	[0.0096]	[0.0096]
Country dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Time dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Observations	10102	10102	10102	10102	10096	10096	10096	10096	10096	10096	10096	10096
Number of banks	1833	1833	1833	1833	1832	1832	1832	1832	1832	1832	1832	1832
R-squared	0.10	0.11	0.11	0.11	0.14	0.14	0.14	0.14	0.17	0.17	0.17	0.17

Note: The dependent variable is bank net interest margin. The explanatory variables are the Herfindahl index, concentration ratio, market share, size and efficiency. Control variables are the capital-to-assets ratio, the loans-to-assets ratio, the share of demand and savings deposits in total deposits, yearly change in gdp, inflation and the short term interest rate. Standard errors are given in brackets. *, ** and *** indicate significance levels of 10, 5 and 1 percent, respectively.

TABLE 4.4

Panel Estimations for Bank Margins for the Sample of Banks in Accession Countries

	SCP versus EFF				bank-specific controls				macro-economic controls			
Variables												
HERF	-12.4039***	-12.0100***			0.0928	0.669			-12.9793*	-12.3887		
	[4.2111]	[4.1959]			[7.1788]	[7.2060]			[7.7293]	[7.7377]		
CR			-5.2578**	-5.2977**			0.8191	0.7618			-0.5954	-0.5643
			[2.3689]	[2.3675]			[3.3226]	[3.3185]			[3.4426]	[3.4346]
MS	3.0569		2.4019		3.2747		3.463		2.1044		2.2587	
	[2.4674]		[2.4243]		[3.0206]		[2.9758]		[3.0317]		[3.0155]	
SIZE		0.0003		0.0003		0.0005		0.0006		0.0007		0.0007
		[0.0005]		[0.0005]		[0.0006]		[0.0006]		[0.0006]		[0.0006]
EFF	-1.4804***	-1.4845***	-1.5180***	-1.5274***	-1.4607***	-1.4842***	-1.4746***	-1.5000***	-1.4684***	-1.5062***	-1.4827***	-1.5247***
	[0.3638]	[0.3665]	[0.3655]	[0.3681]	[0.3789]	[0.3809]	[0.3798]	[0.3819]	[0.3729]	[0.3744]	[0.3746]	[0.3760]
CAP					0.0949***	0.0944***	0.0939***	0.0928***	0.0958***	0.0981***	0.0964***	0.0989***
					[0.0261]	[0.0262]	[0.0259]	[0.0259]	[0.0260]	[0.0260]	[0.0260]	[0.0259]
LTA					0.0539***	0.0543***	0.0537***	0.0541***	0.0582***	0.0583***	0.0576***	0.0577***
					[0.0111]	[0.0111]	[0.0111]	[0.0111]	[0.0110]	[0.0110]	[0.0111]	[0.0111]
DSDEP					0.0164*	0.0166*	0.0161	0.0163*	0.0212**	0.0208**	0.0210**	0.0205**
					[0.0099]	[0.0099]	[0.0099]	[0.0099]	[0.0100]	[0.0100]	[0.0100]	[0.0100]
GDP Growth									0.0781	0.0725	0.0637	0.0583
									[0.0636]	[0.0631]	[0.0642]	[0.0638]
Inflation									0.2382***	0.2405***	0.2152***	0.2189***
									[0.0452]	[0.0451]	[0.0438]	[0.0437]
Interest Rate									0.1446***	0.1447***	0.1460***	0.1460***
									[0.0401]	[0.0400]	[0.0404]	[0.0403]
Country dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Time dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Observations	619	619	619	619	503	503	503	503	487	487	487	487
Number of banks	142	142	142	142	123	123	123	123	122	122	122	122
R-squared	0.18	0.18	0.17	0.17	0.26	0.27	0.26	0.27	0.3	0.3	0.3	0.3

Note: The dependent variable is bank net interest margin. The explanatory variables are the Herfindahl index, concentration ratio, market share, size and efficiency. Control variables are the capital-to-assets ratio, the loans-to-assets ratio, the share of demand and savings deposits in total deposits, yearly change in gdp, inflation and the short term interest rate. Standard errors are given in brackets. *, ** and *** indicate significance levels of 10, 5 and 1 percent, respectively.

TABLE 4.5

Panel Estimations for Bank Margins for the Sample of Banks in Non-Accession Countries

	SCP versus EFF				bank-specific controls				macro-economic controls			
Variables												
HERF	-5.6376**	-5.4772**			13.4941**	14.5280**			-20.7630***	-15.8731***		
	[2.8073]	[2.6842]			[6.4847]	[6.1567]			[6.0972]	[5.7075]		
CR			-7.1394***	-6.9710***			4.5802	5.4816			-12.1782**	-11.8818**
			[2.2761]	[2.2368]			[5.4144]	[5.3782]			[4.8613]	[4.8684]
MS	-0.4541		-0.3857		0.8122		3.3461		10.2811***		6.2437*	
	[3.5854]		[3.4850]		[4.4158]		[4.2304]		[3.8921]		[3.6129]	
SIZE		-0.0008		-0.0007		0.0012		0.0009		-0.0021		-0.0018
		[0.0007]		[0.0007]		[0.0016]		[0.0016]		[0.0015]		[0.0015]
EFF	-9.6567***	-9.4076***	-9.6208***	-9.4019***	-3.0174	-2.999	-3.4258	-2.9499	-2.2957	-0.8354	-1.99	-1.0248
	[1.6782]	[1.6838]	[1.6750]	[1.6810]	[2.4887]	[2.3906]	[2.4929]	[2.4018]	[2.2541]	[2.2398]	[2.2588]	[2.2356]
CAP					0.1937***	0.1999***	0.1953***	0.1959***	0.1418***	0.1197***	0.1356***	0.1188***
					[0.0333]	[0.0342]	[0.0335]	[0.0343]	[0.0300]	[0.0307]	[0.0303]	[0.0309]
LTA					0.0528**	0.0551**	0.0576**	0.0606**	0.0711***	0.0648***	0.0654***	0.0632***
					[0.0255]	[0.0257]	[0.0256]	[0.0258]	[0.0234]	[0.0238]	[0.0235]	[0.0238]
DSDEP					0.0272*	0.0272*	0.0291*	0.0295**	0.0159	0.0163	0.0132	0.0135
					[0.0149]	[0.0149]	[0.0150]	[0.0150]	[0.0126]	[0.0127]	[0.0127]	[0.0128]
GDP Growth									-0.2695**	-0.2832**	-0.2233*	-0.2406**
									[0.1164]	[0.1180]	[0.1178]	[0.1185]
Inflation									0.0573	0.057	0.0768	0.0789
									[0.0673]	[0.0675]	[0.0697]	[0.0696]
Interest Rate									0.0143	0.0176	0.0378	0.0405
									[0.0618]	[0.0621]	[0.0636]	[0.0636]
Country dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Time dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Observations	1032	1032	1032	1032	390	390	390	390	354	354	354	354
Number of banks	304	304	304	304	111	111	111	111	109	109	109	109
R-squared	0.11	0.11	0.12	0.12	0.29	0.28	0.27	0.27	0.24	0.25	0.22	0.24

Note: The dependent variable is bank net interest margin. The explanatory variables are the Herfindahl index, concentration ratio, market share, size and efficiency. Control variables are the capital-to-assets ratio, the loans-to-assets ratio, the share of demand and savings deposits in total deposits, yearly change in gdp, inflation and the short term interest rate. Standard errors are given in brackets. *, ** and *** indicate significance levels of 10, 5 and 1 percent, respectively.

TABLE 4.6

Coefficient Impact

	standard deviation			average coefficient[a)]			average impact[b)]		
	West	Acc	NonAcc	West	Acc	NonAcc	West	Acc	NonAcc
HERF	0.07	0.07	0.12	1.37	-12.68	-18.32	**0.10**	-0.89	**-2.20**
CR	0.1	0.08	0.14	0.92	-0.58	-12.03	**0.09**	-0.05	**-1.68**
MS	0.03	0.09	0.09	-0.69	2.18	8.26	-0.02	0.20	**0.74**
SIZE	1147	311	461	0.00	0.00	0.00	**-0.11**	0.22	-0.90
EFF	0.88	0.34	0.18	-0.22	-1.50	-1.54	**-0.19**	**-0.51**	-0.28
CAP	6.42	6.5	11.58	0.06	0.10	0.13	**0.39**	**0.63**	**1.49**
LTA	23.78	16.02	16.97	0.02	0.06	0.07	**0.37**	**0.93**	**1.12**
DSDEP	31.33	24.83	25.34	0.00	0.02	0.01	**0.09**	0.52	0.37
GDP Growth	1.43	2.59	8.47	0.07	0.07	-0.25	**0.10**	0.18	**-2.15**
Inflation	1.09	7.41	91.19	0.15	0.23	0.07	**0.17**	**1.69**	6.16
Interest Rate	1.27	5.61	74.24	0.14	0.15	0.03	**0.17**	**0.82**	2.05

[a)] Average based on the regressions coefficients of tables 3 to 5 (last four columns).
[b)] Numbers in bold indicate significance at least at the 10 percent level.

TABLE 4.7

Panel Estimations for Bank Margins Including Regional Interactions

	West versus Accession				West versus Non-Accession			
Variables								
HERF	1.2691***	1.2541***			1.5224***	1.5334***		
	[0.3661]	[0.3659]			[0.4026]	[0.4024]		
CR			0.8705***	0.8607***			0.9718***	0.9734***
			[0.2109]	[0.2108]			[0.2316]	[0.2313]
MS	-0.6153		-0.6275		-0.7374		-0.6916	
	[0.6860]		[0.6861]		[0.7642]		[0.7634]	
SIZE		-0.0001***		-0.0001***		-0.0001***		-0.0001***
		[0.0000]		[0.0000]		[0.0000]		[0.0000]
EFF	-0.2306***	-0.2203***	-0.2297***	-0.2192***	-0.2258***	-0.2148***	-0.2242***	-0.2130***
	[0.0254]	[0.0256]	[0.0254]	[0.0256]	[0.0293]	[0.0296]	[0.0293]	[0.0295]
CAP	0.0608***	0.0596***	0.0608***	0.0596***	0.0597***	0.0585***	0.0599***	0.0587***
	[0.0032]	[0.0032]	[0.0032]	[0.0032]	[0.0036]	[0.0037]	[0.0036]	[0.0036]
LTA	0.0165***	0.0165***	0.0165***	0.0164***	0.0151***	0.0149***	0.0152***	0.0151***
	[0.0011]	[0.0011]	[0.0011]	[0.0011]	[0.0012]	[0.0012]	[0.0012]	[0.0012]
DSDEP	0.0030***	0.0029***	0.0030***	0.0029***	0.0030***	0.0028***	0.0030***	0.0029***
	[0.0008]	[0.0008]	[0.0008]	[0.0008]	[0.0008]	[0.0009]	[0.0008]	[0.0008]
GDP Growth	0.0651***	0.0635***	0.0627***	0.0610***	0.0126	0.0062	0.0135	0.0088
	[0.0097]	[0.0097]	[0.0098]	[0.0097]	[0.0108]	[0.0108]	[0.0108]	[0.0108]
Inflation	0.1962***	0.1967***	0.1825***	0.1837***	0.1495***	0.1469***	0.1559***	0.1564***
	[0.0078]	[0.0078]	[0.0075]	[0.0075]	[0.0079]	[0.0079]	[0.0081]	[0.0081]
Interest Rate	0.1293***	0.1287***	0.1302***	0.1295***	0.1198***	0.1188***	0.1258***	0.1272***
	[0.0082]	[0.0082]	[0.0082]	[0.0082]	[0.0072]	[0.0072]	[0.0074]	[0.0074]

(Continued)

TABLE 4.7

Continued

Variables	West versus Accession (Ctd)				West versus Non-Accession (Ctd)			
HERF*Reg	-7.4834***	-6.7489***			-9.8322***	-8.0340***		
	[2.2190]	[2.2308]			[1.2238]	[1.1564]		
CR*Reg			-0.0209	0.2821			-9.2619***	-9.1109***
			[1.0981]	[1.1007]			[1.0110]	[1.0093]
MS*Reg	0.3488		0.1539		7.7069***		6.3414***	
	[1.5694]		[1.5669]		[1.3275]		[1.2646]	
SIZE*Reg		0.0007***		0.0008***		-0.0020***		-0.0022***
		[0.0003]		[0.0003]		[0.0004]		[0.0004]
EFF*Reg	-1.1394***	-1.1872***	-1.1225***	-1.1772***	-2.6724***	-1.9499***	-2.7592***	-2.1372***
	[0.1381]	[0.1388]	[0.1382]	[0.1390]	[0.6789]	[0.6753]	[0.6783]	[0.6744]
CAP*Reg	0.0508***	0.0554***	0.0522***	0.0574***	0.0784***	0.0641***	0.0763***	0.0640***
	[0.0110]	[0.0109]	[0.0109]	[0.0109]	[0.0092]	[0.0092]	[0.0091]	[0.0092]
LTA*Reg	0.0462***	0.0461***	0.0469***	0.0468***	0.0336***	0.0306***	0.0355***	0.0319***
	[0.0045]	[0.0045]	[0.0046]	[0.0046]	[0.0063]	[0.0064]	[0.0063]	[0.0064]
DSDEP*Reg	0.0202***	0.0198***	0.0200***	0.0196***	0.0119***	0.0120***	0.0101***	0.0101***
	[0.0038]	[0.0038]	[0.0038]	[0.0038]	[0.0036]	[0.0036]	[0.0036]	[0.0036]
Country dummies	yes	yes	yes	yes	yes	yes	yes	yes
Time dummies	yes	yes	yes	yes	yes	yes	yes	yes
Observations	10583	10583	10583	10583	10450	10450	10450	10450
Number of banks	1954	1954	1954	1954	1941	1941	1941	1941
R-squared	0.22	0.22	0.22	0.22	0.16	0.16	0.16	0.16

Note: Reg indicates a dummy variable for the regions Accession and Non-Accession, respectively. Standard errors are given in brackets. *, ** and *** indicate significance levels of 10, 5 and 1 percent, respectively.

TABLE 4.8

Panel Estimations for Bank Margins for the Sample of Banks in Accession Countries
- Regulatory Variables and Interactions

	regulatory controls		regulatory interaction: CAP		regulatory interaction: LTA	
Variables						
HERF	-13.0714*	-10.5335	-9.0991	-13.0827*	-10.9736	-12.0441
	[7.9298]	[7.8901]	[8.1290]	[7.7423]	[7.6931]	[7.7884]
MS	2.2503	2.0488	2.9283	2.1579	2.4844	2.1141
	[2.9925]	[3.0374]	[2.9590]	[3.0415]	[2.9861]	[3.0391]
EFF	-1.4818***	-1.4451***	-1.5072***	-1.4717***	-1.5353***	-1.4541***
	[0.3746]	[0.3725]	[0.3739]	[0.3734]	[0.3701]	[0.3730]
CAP	0.0944***	0.0945***	0.4548**	0.1574	0.0965***	0.0956***
	[0.0259]	[0.0260]	[0.2144]	[0.1912]	[0.0257]	[0.0260]
DSDEP	0.0210**	0.0194*	0.0199**	0.0216**	0.0254**	0.0201**
	[0.0100]	[0.0101]	[0.0100]	[0.0101]	[0.0100]	[0.0101]
LTA	0.0578***	0.0585***	0.0540***	0.0582***	0.2747***	0.0102
	[0.0112]	[0.0110]	[0.0111]	[0.0110]	[0.0685]	[0.0526]
GDP Growth	0.0772	0.0478	0.1047	0.0812	0.1132*	0.0625
	[0.0663]	[0.0668]	[0.0660]	[0.0643]	[0.0640]	[0.0657]
Inflation	0.2387***	0.2254***	0.2060***	0.2394***	0.1802***	0.2332***
	[0.0514]	[0.0459]	[0.0492]	[0.0453]	[0.0483]	[0.0455]
Interest Rate	0.1458***	0.1410***	0.1333***	0.1446***	0.1369***	0.1442***
	[0.0411]	[0.0401]	[0.0411]	[0.0401]	[0.0398]	[0.0401]
EBRDetp	0.026					
	[1.0765]					
EBRDbank		1.1646				
		[0.7961]				
CAP*EBRDetp			-0.1258*			
			[0.0741]			
CAP*EBRDbank				-0.0198		
				[0.0610]		
LTA*EBRDetp					-0.0768***	
					[0.0240]	
LTA*EBRDbank						0.015
						[0.0161]
Country dummies	yes	yes	yes	yes	yes	yes
Time dummies	yes	yes	yes	yes	yes	yes
Observations	487	487	487	487	487	487
Number of banks	122	122	122	122	122	122
R-squared	0.3	0.3	0.3	0.3	0.31	0.3

Note: The dependent variable is bank net interest margin. The explanatory variables are the Herfindahl index, concentration ratio, market share, size and efficiency. Control variables are the capital-to-assets ratio, the loans-to-assets ratio, the share of demand and savings deposits in total deposits, yearly change in gdp, inflation and the short term interest rate. Standard errors are given in brackets. *, ** and *** indicate significance levels of 10, 5 and 1 percent, respectively.

TABLE 4.9

Panel Estimations for Bank Margins for the Sample of Banks in Non-Accession Countries
- Regulatory Variables and Interactions

	regulatory controls		regulatory interaction: CAP		regulatory interaction: LTA	
Variables						
HERF	-17.0330***	-25.5628***	-20.8415***	-22.4557***	-17.5570***	-25.7965***
	[6.0523]	[6.6706]	[6.2099]	[6.2103]	[6.1203]	[6.5126]
MS	7.3076*	10.3173***	10.5229***	10.0809***	8.2067**	9.9047**
	[3.9063]	[3.8814]	[3.9593]	[3.8903]	[3.9174]	[3.8760]
EFF	-2.5864	-2.2873	-2.3682	-2.2151	-2.3938	-2.4667
	[2.2373]	[2.2538]	[2.2240]	[2.2577]	[2.2478]	[2.2457]
CAP	0.1285***	0.1399***	0.1654	-0.0385	0.1350***	0.1387***
	[0.0297]	[0.0300]	[0.1503]	[0.1367]	[0.0298]	[0.0299]
DSDEP	0.0104	0.0143	0.0159	0.0161	0.0145	0.0163
	[0.0124]	[0.0126]	[0.0126]	[0.0126]	[0.0124]	[0.0125]
LTA	0.0525**	0.0700***	0.0712***	0.0685***	-0.2031**	-0.1101
	[0.0237]	[0.0234]	[0.0237]	[0.0235]	[0.0991]	[0.0887]
GDP Growth	-0.2075*	-0.2035*	-0.2654**	-0.2205*	-0.2112*	-0.1686
	[0.1151]	[0.1221]	[0.1176]	[0.1218]	[0.1167]	[0.1252]
Inflation	0.0641	0.0492	0.0557	0.064	0.0639	0.0585
	[0.0657]	[0.0671]	[0.0682]	[0.0673]	[0.0663]	[0.0669]
Interest Rate	0.0097	0.004	0.0127	0.0201	0.0145	0.008
	[0.0604]	[0.0618]	[0.0626]	[0.0618]	[0.0609]	[0.0615]
EBRDetp	8.1151***					
	[2.2257]					
EBRDbank		3.0193*				
		[1.7408]				
CAP*EBRDetp			-0.0092			
			[0.0652]			
CAP*EBRDbank				0.0684		
				[0.0507]		
LTA*EBRDetp					0.1163***	
					[0.0408]	
LTA*EBRDbank						0.0700**
						[0.0331]
Country dummies	yes	yes	yes	yes	yes	yes
Time dummies	yes	yes	yes	yes	yes	yes
Observations	354	354	354	354	354	354
Number of banks	109	109	109	109	109	109
R-squared	0.28	0.25	0.24	0.25	0.27	0.25

Note: The dependent variable is bank net interest margin. The explanatory variables are the Herfindahl index, concentration ratio, market share, size and efficiency. Control variables are the capital-to-assets ratio, the loans-to-assets ratio, the share of demand and savings deposits in total deposits, yearly change in gdp, inflation and the short term interest rate. Standard errors are given in brackets. *, ** and *** indicate significance levels of 10, 5 and 1 percent, respectively.

TABLE 4.10

Description of Variables and Data Sources

Net Interest Margin[1]	Difference between interest income and interest expenses as a proportion of total earning assets (%)
Herfindahl Index[1]	The sum of squared market shares in the loan market in country j at time t (between 0 and 1)
Concentration Ratio[1]	The amount of loans granted by the largest bank in country j at time t to total bank loans in country j at time t (ratio)
Market Share[1]	A measure of relative market power. Calculated as bank i's share of assets at time t in country j's total bank assets at time t (between 0 and 1)
Size[1]	The ratio of total assets of bank i in country j at time t to the assets of the median bank in country j at time t (%)
Efficiency[1]	The inverse of total overhead costs to total assets of bank i in country j at time t (%)
Capital to Assets[1]	The ratio of total equity to assets of bank i in country j at time t (%)
Loans to Assets[1]	The ratio of total loans to assets of bank i in country j at time t (%)
Dem. and Sav. Deposits[1]	The proportion of demand and savings deposits in total deposits of bank i in country j at time t (%)
GDP Growth[2,3]	Real GDP growth (YOY) in country j at time t (%)
Inflation[2,3]	The (end of year) change in CPI in country j at time t (%)
Interest Rate[3]	The real short term interest rate. Calculated as the nominal interest rate minus inflation in country j at time t (%)
EBRD Bank Reform[2]	Index based on the number of banks (and the share of foreign owned banks), the asset share of state-owned banks, the percentage of bad loans, credit to the private sector and stock market capitalization (between 1 and 4)
EBRD Enterprise Reform[2]	Index based on the amount of budgetary subsidies, the efficiency of tax collection for social security, the share of industry in total employment and the change in labor productivity in industry (between 1 and 4)

[1] Source: Fitch/IBCA/Bureau Van Dijk's Bankscope and own calculations
[2] Source: EBRD Transition reports
[3] Source: IMF International Financial Statistics

Countries Included in the Subsamples

Western Europe	Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom
Accession	Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovak Republic, Slovenia
Non-accession	Albania, Belarus, Bosnia, Bulgaria, Croatia, Macedonia, Romania, Russia, Ukraine, FR Yugoslavia

Chapter 5

Foreign banks in Eastern Europe: mode of entry and effects on bank interest rates.[1]

5.1 Introduction

Many emerging economies are hesitant about letting foreign banks enter their market. When deciding on the liberalization of the banking sector, policy makers weigh the costs and benefits of foreign bank entry for the domestic banks and for the corporate sector. On the one hand, governments fear that foreign banks will engage in *cherry picking*, leaving the domestic banks with bad loans in their portfolio. On the other, the local banking market can benefit from the better technologies that foreign banks use through learning and spill-over effects. Through an increase in bank competition, domestic firms may gain by paying lower interest rates for their loans.

The empirical facts about bank market entry differ substantially between regions. In the new EU member states, the share of foreign banks in total banking sector assets amounted to about 55 percent in 2003. This was at a time when foreign banks were almost absent in the large EU-15 countries (ECB, 2005). This is surprising, because there are no formal restrictions on bank market entry. Interestingly, the

[1] An adapted version of this chapter will appear in the Conference Proceedings of the OeNB Conference on European Economic Integration: Financial Development, Integration and Stability in Central, Eastern and South-Eastern Europe, Edward Elgar, UK, 2006. This chapter is based on: Claeys, Sophie, and Christa Hainz (2006), "Acquisition versus greenfield: The impact of the mode of foreign bank entry on information and bank lending rates. Theory and evidence," ECB Working Paper, May 2006.

foreign-owned banks in more developed countries have a lower profitability than domestic banks (Claessens et al., 2001).

Rather the opposite situation is found in emerging economies. In these markets, foreign banks are often more profitable and efficient than domestic banks (Demirgüç-Kunt and Huizinga, 2000, Bonin et al., 2005, Martinez Peria and Mody, 2004). More importantly, foreign bank presence may improve access to credit for creditworthy firms (Giannetti and Ongena, 2005). In Eastern Europe, foreign bank entry has increased competition and improved lending technologies so that lending to small and medium-sized enterprises and retail markets gradually increased (De Haas and Naaborg, 2005).

Policy makers do not only decide on the liberalization of bank entry but often also on the mode of entry. Depending on their evaluation of the entry mode, governments provide incentives that encourage foreign bank entry either through a greenfield investment, by establishing a foreign *de novo* bank, or through acquisition. However, while empirical evidence shows that foreign *de novo* banks are more profitable and efficient than foreign-acquired banks (Martinez Peria and Mody, 2004, Majnoni et al., 2003), the differential impact of the mode of entry on domestic bank lending conditions and competition remains unclear.

In this chapter, we shed light on how foreign bank entry impacts the host country's banking market, depending on the *entry mode*. We analyze the impact of the mode of entry on competition. Specifically, we analyze the effects of the mode of foreign bank entry on the lending rate in markets where firms heavily depend on bank financing. We investigate whether bank lending rates are higher if foreign entry predominantly happens through the establishment of a *de novo* bank or through the acquisition of a domestic bank. Neither the theoretical nor the empirical literature provides complete answers to this question.

We focus on the transition economies of Central and Eastern Europe, where foreign banks are now dominating the market (foreign bank market shares went up from approximately 10 percent in 1995 to almost 64 percent in 2003, on average). Furthermore, these markets are characterized by heterogeneous forms of market entry, which moreover vary over time. This allows scope to analyze the direct or initial impact of foreign entry.

5.2 The impact of the mode of foreign bank entry on creditor information

In Claeys and Hainz (2006), we develop a theoretical model in which domestic banks possess private information about their incumbent clients but foreign banks have better screening skills. We argue that, after foreign bank entry, information on old and new firms' creditworthiness is unevenly distributed between the foreign and the domestic banks. First, the domestic bank has access to *soft* information about those firms with which it has already established a relationship in the past. This generates an absolute information advantage for the domestic bank about these old firms' creditworthiness. Second, in an emerging market context, the foreign bank is assumed to possess better screening skills than the domestic bank. This implies that the foreign bank will be able to better process *hard* information about new firms that apply for credit through credit evaluation. We show that this information advantage allows the foreign bank to offer slightly lower rates than the domestic bank. However, the information advantage also enables the foreign bank to extract rents from firms that apply for credit for the first time while offering them credit contracts. Foreign banks will therefore be able to offer more competitive rates to new credit applicants than the domestic banks. As a result, foreign bank entry will drive down a country's average interest rate for new loans.

The foreign bank's scope for extracting rents from new applicants depends on the mode of entry. A foreign greenfield bank will only enter the market if its advantage in screening new firms compensates the disadvantage it has compared to the domestic banks with respect to *soft* information about old firms. If a foreign bank acquires a domestic bank, it also acquires the credit portfolio which contains information about the quality of client firms. In addition to this acquired information, the foreign-acquired bank possesses superior screening skills compared to the domestic bank. The distribution of information between domestic and foreign banks and consequently the degree of competition depend on the mode of entry. We refer to this differential effect as a "competition effect" that depends on the mode of entry.

This argument indicates that interest rates for new creditors will be lower when the foreign bank enters the market by establishing a foreign *de novo* bank compared to acquiring a domestic bank. However, the average interest rate that a bank demands depends on a bank's portfolio composition of newly applying and old firms. Therefore, we additionally analyze what we refer to as the "portfolio composition effect". Old firms might get more favorable rates from their incumbent bank, such that the average lending rate demanded by acquired banks may still be lower than

the one from a foreign *de novo* bank.

5.3 Entry policy in Central and Eastern Europe

The heterogeneous process of deregulation in the countries of Central and Eastern Europe led to an uneven reduction of the barriers to entry. The countries that we analyze are Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, the Slovak Republic and Slovenia for the period 1995–2003. These countries have shown widely different policies towards the mode of foreign bank entry. Foreign bank entry was sometimes allowed already early in transition - with changing restrictions on the mode of entry.

The example of Poland illustrates how government policy has changed during the last 15 years. In the very beginning of the transition process, bank entry was not regulated. Foreign banks were even given tax holidays. After many small, undercapitalized banks had entered, the minimum capital requirement increased and tax holidays for foreign banks were eliminated. Starting in 1992, the Polish government preferred selling its domestic banks to foreign owners over issuing new bank licenses to foreign banks. The aim of the politicians was to sell (often weak) domestic banks to foreign banks, which brought in new capital and had the expertise to restructure these banks. A few banks were privatized between 1993 and 1997, but at the time the government was mainly selling minority shares to foreign investors. In 1999 the government started to sell majority shares of the state-owned banks to foreign investors and allowed foreign banks to open branches without restraints (NBP, 2001).

5.3.1 Data on ownership structure

We want to determine and compare what average lending rates look like if a foreign bank enters either through a greenfield investment or through acquisition. For this purpose, we create a database that captures the time-varying ownership structure of individual banks in Central and Eastern Europe.

We use yearly data of about 200 individual banks in 10 Eastern European transition countries, for the period 1995–2003. For each country, we gather commercial banks' balance sheets and income and loss accounts from the *BankScope* database maintained by Fitch/IBCA/Bureau Van Dijk. Consolidated statements were preferred but unconsolidated statements were used when the consolidated ones were not available. We obtain historical bank-specific ownership data from central and

commercial banks' annual reports. Each bank is classified as either domestically- or foreign-owned, whereby a foreign bank can be the result of a cross-border acquisition or a *de novo* investment. A bank is classified as foreign when at least 50 percent of its shares is foreign-owned. We distinguish between banks that were foreign-owned since the start of the sample in the year 1995 and banks that became foreign-owned from 1995 onwards. Each foreign bank can enter the sample either as a foreign *de novo* bank or as a foreign-acquired bank.

In order to capture the differences in information distribution and screening skills as described above, we assume that for each bank the following events related to acquisition can occur during the sample period:

(1) foreign *de novo* bank acquires a domestic bank;

(2) foreign-acquired bank acquires domestic, foreign-acquired or foreign *de novo* bank;

(3) foreign *de novo* bank acquires foreign *de novo* bank;

(4) domestic bank acquires domestic bank.

For case (1), the merged bank is classified as having entered via acquisition from the date of acquisition onwards. For case (2), banks remain classified as foreign-acquired banks. This classification enables us to distinguish between banks which have (a) access to *soft* information but have inferior screening skills (domestic banks), (b) *soft* information and a superior screening ability (foreign-acquired banks) and (c) only screening ability (foreign *de novo* banks). For cases (3) and (4) we assume that these mergers lead to bigger banks, without generating an impact on information distribution. A detailed overview of the ownership history of all the banks included in our analysis is provided in Claeys and Hainz (2005).

Table 5.1: Foreign bank presence and market share by mode of entry (%).

Year	*Foreign bank*		*Foreign MA*		*Foreign De Novo*	
	Foreign bank presence	Market share	Foreign bank presence	Market share	Foreign bank presence	Market share
1992	15.96		2.66		13.3	
1993	18.47		3.15		15.32	
1994	20.73		2.85		17.89	
1995	22.39	10.82	3.47	0.82	18.92	10
1996	27.05	8.02	5	2.48	22.14	5.54
1997	32.75	16.28	10.14	9.76	22.73	6.53
1998	36.65	25.36	12.59	16.74	24.46	8.62
1999	41.25	35.23	15.75	25.38	25.98	9.85
2000	47.03	45.48	21.79	34.18	25.64	11.3
2001	50.66	55.37	25.33	40.64	25.78	14.73
2002	52.63	62.36	29.47	46.65	23.67	15.71
2003	56.93	63.94	33	48.34	24.5	15.61
Average	35.21	35.87	13.77	25	21.69	10.88

Note: *Foreign MA*: a foreign bank that acquires a domestic bank and obtains a majority ownership share. *Foreign De Novo*: a foreign bank that enters the market as a *de novo* bank that has a majority foreign ownership share. Foreign bank presence is the number of foreign to domestic banks. Foreign bank market share is the share of foreign loans to the country total. The sum of values for *Foreign MA* and *Foreign De Novo* can differ from the value for *Foreign Bank* due to rounding differences. Source: Own calculations based on Bankscope and central bank and bank annual reports.

5.3.2 Summary statistics

Table 5.1 presents the average percentage of foreign bank presence and market share in total loans by mode of entry for the period 1992–2003.

Foreign bank participation has increased dramatically. In 1992, about 16 percent of the banks in our sample were foreign-owned. Foreign bank presence rose to 57 percent in 2003, the year in which they possess a market share of 64 percent. In the beginning of the 1990s, the majority of foreign bank entry is via the establishment of a *de novo* bank. While foreign greenfield banks represent almost 22 percent of the market on average, foreign bank acquisitions account for about 14 percent. However, foreign-acquired banks gradually increase their presence over the years and account for 33 percent of all banks in our sample by 2003. Foreign acquisitions eventually became the dominant mode of entry: banks that were foreign-acquired between 1992 and 2003 have a market share of 25 percent, on average, while foreign banks that entered the Central and Eastern European banking markets through a greenfield investment have on average a market share of 11 percent. Since foreign-acquired banks buy a customer base, their market share grows much faster than that of *de*

novo banks. In 2003, foreign-acquired banks possess a market share of 48 percent whereas foreign *de novo* banks only have 16 percent of the credit market.

Figures 5.1 and 5.2 show how foreign bank presence varies over countries and over time, by mode of entry. Figure 5.1 presents the percentage of foreign bank presence, Figure 5.2 shows market shares starting from 1995.

The figures reveal some important differences between the countries. The figures show that countries that joined the European Union in May 2004 differ from those applying for membership in 2007. In Bulgaria and Croatia, the neighbors of the enlarged European Union, the market share of foreign banks is about 46 percent and 36 percent respectively in 2003 and hence remains significantly lower than in the eight other countries.

In Hungary, foreign banks already out-numbered domestic banks in 1993. Due to the Hungarian liberalization strategy that started in the early 1980s, the share of foreign banks has gradually risen and now represents more than 70 percent of the market. In the beginning of the 1990s, the Czech and the Polish banking sector were also characterized by a large inflow of foreign *de novo* banks. The cumulative market share for *de novo* banks is, however, relatively small (7 and 17 percent) compared to the market share for *de novo* banks in Hungary (24 percent). In 1999 the Polish government started to sell majority shares of domestic banks to foreign investors. This resulted in the number of foreign banks in Poland exceeding the number of domestic banks in 1999. Foreign banks dominate the market in terms of market share since 2000.

The Baltic countries started liberalizing market entry into the banking sector relatively late. Therefore, the changes observed are even more dramatic. Estonia, for example, has only three foreign-owned banks (AS Sampo Pank, Hansabank and Eesti Uhispank), but Hansabank alone accounts for over 70 percent of assets since 2001 (see Claeys and Hainz, 2005). Thus, banking in Estonia can be considered as a predominantly foreign affair.

In Slovakia, foreign banks already entered in the early 1990s but they did not become significant players before the year 2000. In contrast, although Slovenia is characterized by a relatively low percentage of foreign bank presence, foreign banks obtained over 60 percent of bank loans by 2002. These loans are almost exclusively granted by foreign-acquired banks. Foreign *de novo* banks hardly play a role on the credit market in Slovenia.

Figures 5.1 and 5.2 illustrate that there is a considerable amount of foreign entry occurring in most countries included in our sample. Furthermore, the market shares of foreign banks have gradually risen and are starting to dominate the market.

Figure 5.1: Foreign bank presence by mode of entry (%). Source: Own calculations based on Bankscope, central banks and bank annual reports.

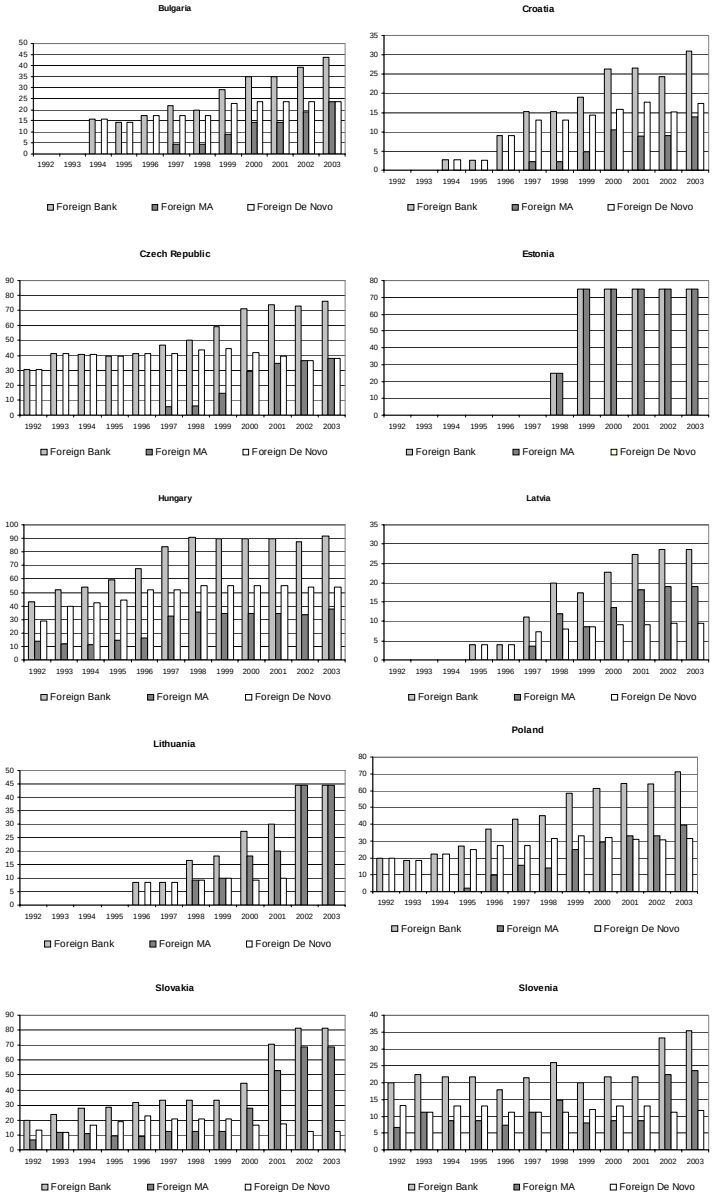


Figure 5.2: Foreign bank market share by mode of entry (%). Source: Own calculations based on Bankscope, central banks and bank annual reports.

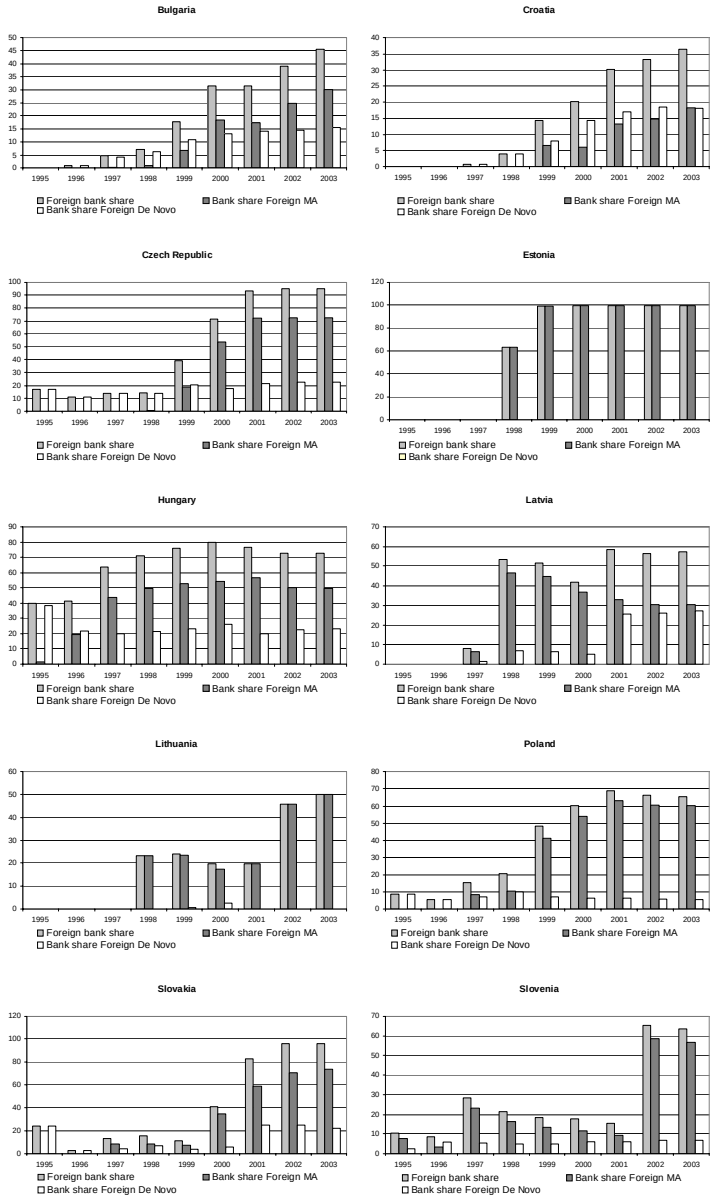
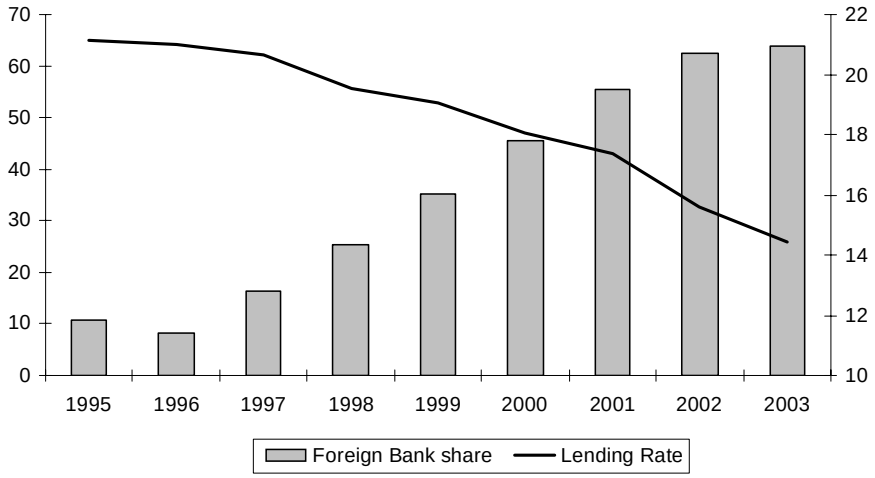


Figure 5.3: Evolution of bank lending rates (right scale) and foreign bank market share (left scale) (%). Note: Bank lending rates (%) are calculated as interest income over (two year) average loans (3 year moving average). Foreign bank market share (%) is the ratio of foreign loans to the country-total. Source: Own calculations based on Bankscope and central banks and bank annual reports.



Together with the increase in foreign acquisitions, banking markets became more and more concentrated. This resulted in an average market share of almost 60 percent held by the top 3 banks per country.

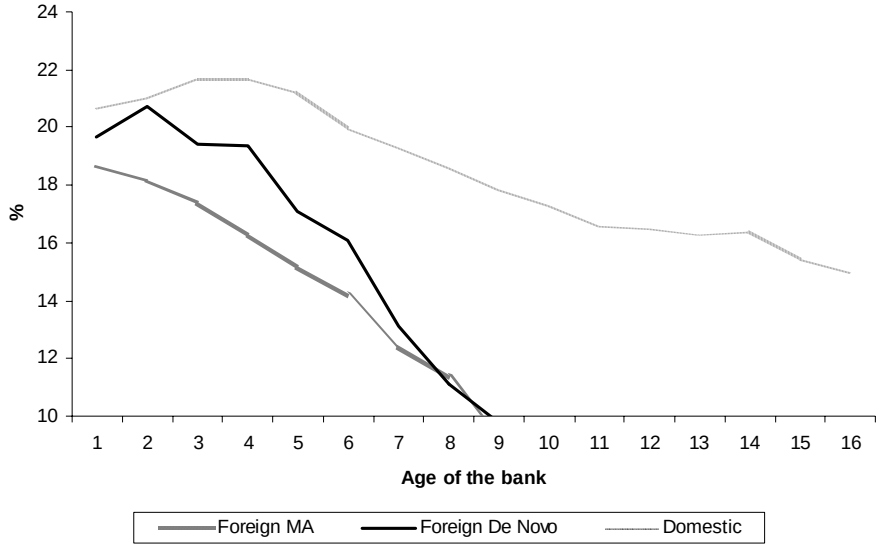
5.3.3 Evolution of bank lending rates by ownership structure

Figure 5.3 presents the evolution of average bank lending rates and foreign bank market shares between 1995 and 2003. Compared to Western Europe, bank interest rates are still relatively high, but decreased significantly from 22 percent in 1995 to 13 percent in 2003. At the same time, foreign bank market shares increased dramatically to about 64 percent.

This figure gives a first indication that a higher foreign bank share in loans is associated with a lower average lending rate, which would support the competition effect that we describe above. We investigate this hypothesis further by using regression analysis.

Since we cannot disentangle individual bank-firm relationships through bank balances, we cannot observe the share of old and new firms that apply for credit at the bank. We do however observe the average interest rate that banks charge

Figure 5.4: Average lending rates by mode of entry: evolution per year after entry. Note: Bank lending rates (%) are calculated as interest income over (two year) average loans (3 year moving average). *Foreign MA*: a foreign bank that acquires a domestic bank and obtains a majority ownership share. *Foreign De Novo*: a foreign bank that enters the market as a *de novo* bank that has a majority foreign ownership share. *Domestic*: a domestic bank. Source: Own calculations based on Bankscope and central banks and bank annual reports.



to both types of customers. Figure 5.4 graphs how the average lending rate evolves per year after the foreign bank has entered the market, by mode of entry. Figure 5.4 also shows the evolution of domestic bank interest rates over the years after entry. From the figure it is clear that on average, foreign banks charge lower interest rates than domestic banks (15.5 and 18.5 percent respectively). However, in the first year after entry, foreign and domestic banks' lending rates do not differ significantly. Furthermore, domestic banks have been operating relatively longer in the market compared to foreign banks. One corollary of this is that in the first year after entry, foreign banks may be charging higher rates than domestic banks that have been in the market longer at that time. However, foreign banks reduce their lending rates much faster compared to domestic banks. We analyze these issues in more detail in the following section.

5.4 Regression analysis

5.4.1 Estimation strategy

We empirically verify the following hypotheses for observed lending rates:

- *Hypothesis 1:* Foreign banks charge lower rates than domestic banks, on average. Due to better screening skills, foreign banks are able to undercut the domestic banks' lending rates, irrespective of their mode of entry.

  We include a variable *Foreign Bank* to test whether foreign and domestic bank lending rates significantly differ. *Foreign Bank* is a dummy variable that is one for banks that are already foreign owned at the start of the sample (1995).

- *Hypothesis 2:* Acquired banks offer higher lending rates to new applicants than greenfield banks. The acquired bank lending rate offered to incumbent firms is however below the rate offered to new applicants. Therefore, depending on the loan portfolio composition of the acquired and the domestic banks, the average expected repayment of foreign greenfield ($E(R^G)$), domestic ($E(R^D)$) and foreign-acquired banks ($E(R^A)$) can be ranked either as

  - $E(R^D) < E(R^A) < E(R^G)$ or as
  - $E(R^D) > E(R^A) > E(R^G)$.

  The higher the share of successful firms the more likely it is that the lending rate of the greenfield bank is higher than the average lending rate of both the domestic and the acquired bank. To test whether foreign-acquired and foreign greenfield banks charge lower rates compared to domestic banks, we include *Foreign MA* and *Foreign Greenfield*. *Foreign MA* is a dummy variable that is one from the moment that a foreign bank acquires a domestic bank within the sample period and obtains a majority ownership share. *Foreign Greenfield* is a dummy variable that is one from the moment that a bank entered during the sample period as a foreign *de novo* bank. We interact the mode of entry variables with the age of the bank to account for age dynamics. As foreign banks become more acquainted with the market, differences in information asymmetries will gradually disappear. Moreover, domestic banks will benefit from positive spill-over effects following entry and invest in better screening technologies. We therefore expect that lending rates converge as banks grow older.

- *Hypothesis 3:* Foreign bank entry negatively impacts domestic bank lending rates, irrespective of the mode of entry.

  Due to increased competition, lending rates for new applicants decrease and the hold-up problem that old firms face will be significantly reduced. We include *Foreign bank share*, the ratio of foreign loans to total market loans, to test for the competition effect. We expect a significant negative impact of foreign bank market share on domestic bank lending rates.

- *Hypothesis 4:* The negative impact of foreign bank entry on domestic bank lending rates is more pronounced when a majority of foreign banks entered via a greenfield investment.

  Domestic banks reduce their interest rates more for both good old firms and new applicants when foreign banks enter through a greenfield investment. To test this differential competition effect, we differentiate foreign bank market share in loans and define *Bank share of Foreign MA* versus *Bank share of Foreign Greenfield*. We expect a larger negative impact on domestic bank lending rates following entry via greenfield investment.

In what follows, we analyze the impact of the mode of foreign bank entry on a measure for the lending rate, while controlling for a number of variables. In particular, we estimate regressions of the following form:

$$\begin{aligned} r^L_{i,j,t} \quad = \quad & \beta_0 + \beta_1 \cdot Foreign\ Bank_{i,j} + \\ & \beta_2 \cdot Foreign\ MA_{i,j,t} + \\ & \beta_3 \cdot Foreign\ Greenfield_{i,j,t} + \\ & \beta_4 \cdot Foreign\ Bank\ Share_{j,t} + \\ & \beta_5 \cdot CONTROLS + \\ & \gamma_{j,t} \cdot [CountryFE \cdot YearFE] + \varepsilon_{i,j,t}. \end{aligned} \tag{5.1}$$

The dependent variable is the (nominal) lending rate, defined as:

$$r^L_{i,j,t} = \frac{RI_{i,j,t}}{\frac{1}{2}(L_{t-1} + L_t)},$$

with $RI_{i,j,t}$ interest income and $L_{i,j,t}$ the volume of loans for each bank i in country j at time t, taken from the *Bankscope* database. Since we are dividing a flow variable by a stock variable, we use the average of the stock variable between t and $t-1$. Next

to variables that capture the mode of entry, we control for a number of bank and country-specific variables that are expected to determine bank lending rates similarly across banks. To account for the macroeconomic developments within a country, we include measures for GDP growth, inflation and the real short term interest rate. We include the EBRD index for enterprise reform to control for the share of successful firms in a country. This index provides a ranking of the liberalization progress and institutional reform in the corporate sector. Finally, all regressions include the interactions between country and year dummies. In comparison to using country and time fixed effects additively, we do not have to assume that year effects are the same for each country. Instead, we assume that the average interest rate is fixed for all banks in each country-year while it can differ across countries and over time. Definitions and sources of all the variables are described in Table 5.2.

5.4.2 Descriptive statistics and sample properties

We use yearly data of about 200 individual banks in 10 Eastern European transition countries, namely Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia for the period 1995-2003. Table 5.3 presents the means of the variables used for estimation. Foreign bank participation in the sample encompasses 15% of foreign banks that are foreign from the start of the sample (with an average market share of 41%), 20% of foreign acquisitions (with a market share of 28%) and 5% foreign *de novo* banks (with a market share of 5%). Figures 5.1 and 5.2 indicated that in the beginning of the 1990s, foreign entry predominantly happened via establishing foreign *de novo* banks. Figure 5.1 indicated that a large proportion of the original foreign banks in our sample were initiated as *de novo* investments. Figure 5.2 showed that foreign-acquired bank market shares however dominate *de novo* bank market shares since 1997. Together with a wave of foreign acquisitions, bank markets became more and more concentrated. On average, the market share of the top 3 banks per country amount to almost 60 percent. The mode of entry variables used for estimation are defined within the sample, such that we can adequately assess the impact of entry, depending on the mode. This additionally enables us to interpret age dynamics appropriately.

5.4.3 Identification strategy

Before estimating equation (5.1), we need to control for a potential endogeneity problem, namely that foreign banks may (a) enter markets that offer high expected profits and (b) ex-ante choose the most profitable mode of entry.

First, observing a positive correlation between either mode of entry and lending rates does not provide a conclusive answer about the direction of causality. To alleviate doubts on causality, we instrument *Foreign bank share* (also differentiated by mode) with a number of preset, country-specific regulatory features that facilitated foreign bank entry in Central and Eastern Europe.

The countries under analysis have shown widely different policies towards (the mode of) foreign bank entry.[2] Even when foreign bank entry was sometimes allowed already early in transition - with changing restrictions to the mode of entry - there was a continuing reduction to the barriers of (the mode of) entry during the years we consider. After abolishing formal restrictions to entry, other obstacles gradually vanished: creditor right enforcement improved and credit registries - either private or public - were introduced to alleviate asymmetric information problems in lending (Djankov et al., 2005). We assume it is unlikely that foreign bank presence systematically impacted these changes in regulation which therefore offer legitimate candidates to instrument and exogenously determine foreign bank presence.

The instruments that we use for *Foreign bank share* are the following. First, we use a dummy variable for the incorporation of a credit registry, taken from Djankov et al., 2005. Given that bank entry is allowed, information sharing on borrower history may make entry in general and entry via a greenfield investment in particular more attractive. Second, we use the *Creditor Rights Index* taken from Djankov et al., 2005. An improvement in the legal protection of creditors has been shown to be positively related to banks' willingness to lend, especially for foreign banks (Haselmann et al., 2005; Giannetti and Ongena, 2005). Third, we include factors of the *Index of Economic Freedom* (Heritage Foundation) that capture a country's institutional aptitude to foreign bank entry.[3] The higher the score on a factor, the greater the level of government interference in the economy and the less economic freedom a country enjoys. It is therefore expected that foreign bank entry will be lower for countries that score high on these factors. Fourth, we include the number of banks that can be considered as potential targets by foreign banks to control for takeover potential. We expect this to be positively (negatively) correlated with *Bank share of Foreign MA* (*Bank share of Foreign Greenfield*).

Second, we instrument the mode of entry dummy variables. Foreign banks may

[2] For an overview, see Bonin et al., 1998. For a detailed listing of foreign de novo entry, foreign and domestic mergers and acquisitions between 1990 and 2003 in Central and Eastern Europe see Claeys and Hainz (2005).

[3] Specifically, the factors are related to: Trade Policy; Fiscal Burden of Government; Government Intervention in Economy; Monetary Policy; Capital Flows and Foreign Investment; Banking and Finance; Wages and Prices; Property Rights; Regulation; Informal Market Activity.

acquire domestic banks that either have high profits (and high lending rates), implicating a positive reversed causality, or foreign banks may acquire domestic banks that are most efficient (and have low lending rates), leading to a negative reversed causality between lending rates and *Foreign MA*. From the theoretical model we argue that if *Foreign MA* leads to lower average lending rates, this is due to a relatively large presence of successful firms in the market (the portfolio composition effect). Vice versa, a positive relation would result when many firms apply for credit for the first time relative to the share of successful firms. In order to be able to draw these conclusions, we need to instrument *Foreign MA*. A foreign bank may alternatively choose to enter as a *de novo* bank, because it wants to avoid bearing the cost of potentially inheriting bad customers. Indeed, a greenfield bank may be better able to control the costs of entry (because it can start with a clean balance sheet, has no uncertainty related to acquiring an existing bank) and can therefore charge lower lending rates compared to its competitors.

We instrument *Foreign MA* and *Foreign Greenfield* by first estimating a logistic model and then plugging in estimated probabilities in our second stage regression.[4] Next to the current an lagged exogenous variables, we include the lagged lending rate as instruments.

5.4.4 Results

Table 5.4 presents the estimation results for equation (5.1) that includes all banks. The first three columns show estimates that are based on ordinary least squares regressions. The last three columns show the results when controlling for endogeneity by using instrumental variable estimation.

The explanatory power of the first stage regressions is relatively high. On average 85% of *Foreign bank share* can be explained by country-specific institutional characteristics, while the logistic model for the *Foreign MA* and *Foreign Greenfield* dummies correctly classifies 90% of the observations by mode of entry. We first show results without controlling for age dynamics in columns I and IV. We subsequently include linear (II and V) and quadratic (III and VI) age dynamics in the regressions. Once we control for endogeneity, the quadratic effects that were found for greenfield banks disappear. Therefore the baseline results that we further refer to are shown in model (V).

First, it follows that foreign banks, on average, charge lower lending rates -

[4]The estimated probabilities are set to zero if smaller than 0.5, one otherwise.

about 2.55% less than domestic banks.[5] Second, foreign-acquired and foreign *de novo* banks do not charge significantly less than domestic banks, on average. The age dynamics however indicate that both acquired and *de novo* banks respectively charge 0.14% and 2% more than domestic banks in the first year after entry. Both types of banks however significantly reduce their lending rate a couple of years after entry. This observation would be consistent with an increase in the share of new applicants over time, such that the competition effect starts to dominate the portfolio composition effect.[6] Third, a higher foreign bank share in loans has a significantly downward impact on the average lending rate, which supports the competition effect. This finding corroborates previous empirical literature (Martinez Peria and Mody (2004), Claessens et al. (2001)).

In order to be able to fully disentangle the impact of foreign greenfield banks on bank lending rates, we include the number of banks as a control variable. The results indicate that a higher number of banks leads to higher bank lending rates. This is surprising at first, but can be explained as follows. Even though the countries in our sample have been characterized by an inflow of greenfield banks in the early 1990s, most bank entry happened via foreign acquisitions afterwards (see Figures 5.1 and 5.2). Moreover, a number of failures and mergers led to a gradual reduction of the number of banks in the later years of our sample. The process of consolidation has therefore likely led to a reduction in lending rates, due to efficiency gains.

The index of enterprise reform is always positive and significant. Progress in the corporate sector will likely lead to a larger share of new firms that need to be credit financed, leading to higher lending rates.

In Table 5.5, we investigate hypothesis 4, namely whether there is a differential competition effect on domestic bank lending rates, depending on the mode of entry. We present separate regression results for the group of domestic and foreign banks. The coefficients for *Foreign MA* and *Foreign Greenfield* now show the difference in average lending rates relative to banks that were already foreign owned in 1995. First, the results in columns (II) and (IV) indicate that neither foreign *de novo* nor foreign-acquired banks charge significantly different lending rates than the original foreign banks. Second, when we control for endogeneity, the competition effect can be corroborated for domestic banks. The results in model (III) indicate that a one percent increase in foreign *de novo* market share leads to a reduction in domestic

[5] This finding is in line with the result by Dell'Ariccia and Marquez (2004), who show that if a foreign bank with lower costs enters, the incumbent bank reacts by lending more to firms in opaque sectors. As a result, the domestic bank demands higher rates then the foreign bank.

[6] We additionally investigated the impact of mergers between two foreign banks on lending rates, but this was never significant. These results are available upon request.

bank average lending rates of 0.19% compared to a reduction of 0.10% following a one percent increase in foreign-acquired market share. These results indicate that competition is more intense when entry predominantly happened via a greenfield investment, although the two coefficients differ only marginally significantly.

The results in Table 5.4 revealed a significant positive impact of market concentration on average lending rates. The results in Table 5.5 however show that a highly concentrated market does not impact foreign interest rates but it increases domestic banks' lending rates. On the one hand, highly concentrated markets may render competition less intense, which may lead to higher lending rates (Berger, 1995). On the other, highly concentrated markets may be the result of a consolidation process in which banks with superior management or production technologies have lower costs and subsequently can offer more competitive interest rates on loans, leading to a negative relationship between market concentration and lending rates. Thus, while foreign entry increased competition, especially via the entry of foreign *de novo* banks, the ongoing consolidation process may eventually hamper competition and lead domestic banks to charge higher lending rates.

5.5 Concluding Remarks

Credit markets in many Eastern European countries are now dominated by foreign-owned banks. This ownership structure resulted from the liberalization of foreign bank entry in the early 1990s and the privatization of state-owned banks, mainly by selling majority shares to foreign investors. The majority of loans from foreign banks is granted by acquired banks. The presence of foreign-acquired banks as measured by their relative number among the banks in our dataset increased somewhat slower than that of foreign *de novo* banks. However, since market entry through acquisition allows acquiring a credit portfolio and a customer base, acquired banks were able to expand their market share much faster than the foreign *de novo* banks. Our data indicate that the interest rate decreased after foreign bank entry. Indeed, using regression analysis, we find that a higher foreign bank share in loans negatively impacts the average lending rate, which supports the competition effect. Moreover, we document that an increase in foreign *de novo* market share leads to a greater reduction in domestic bank average lending rates compared to the reduction following an increase in foreign-acquired market share. This indicates that competition is more intense when entry predominantly happened through foreign *de novo* investments.

Our empirical analysis indicates that the competition effect is indeed stronger when entry happened predominantly through a greenfield investment. Initially, the

portfolio composition effect dominates the competition effect. As a result, both foreign acquired and foreign *de novo* banks charge higher lending rates than domestic banks in the first year after entry. After a couple of years, both banks significantly reduce their interest rates, below the domestic one. This follows from the competition for new firms - which subsequently impacts the competition for old firms, that are able to get lower interest rates as well.

Our analysis does not explicitly address the question which entry mode is optimal. However, our model suggests that the optimal entry mode depends crucially on the characteristics of the host market and the costs of entry. Market entry by greenfield investment is unlikely to be attractive in established market economies where only few firms are new entrants on the credit market. Market entry by acquiring an existing bank may be subject to considerable uncertainty since it is difficult to determine the quality of the target bank's credit portfolio. These arguments already point out that the optimal mode of entry depends on whether the host country is an established market economy or an emerging market. Although the results in the previous literature highlight the existence of these differences, so far, there is hardly any explanation for them.

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5.A Tables

Table 5.2: Variable definitions and sources.

Variable	Description	Source
1. Dependent variable		
The (nominal) lending rate	The share of interest income (flow variable) over loans (stock variable). Since we are dividing a flow variable by a stock variable, we use the average of the stock variable between *t* and *t-1*. (%).	Fitch/IBCA/BvD/Bankscope.
2. Ownership/mode of entry variables.		
a) Foreign Bank	A dummy that is one for banks that were already foreign-owned before the start of the sample. These include all the greenfield banks or foreign acquisitions (that resulted in majority foreign ownership) that happened before or in 1995. *Foreign Bank* indicates the own effect of bank origin or the own effect of foreign bank presence.	Claeys and Hainz (2005).
b) Foreign MA	A dummy that is one from the moment that a foreign bank acquires a domestic bank within the sample period and obtains a majority ownership share.	Claeys and Hainz (2005).
c) Foreign Greenfield	A dummy that is one from the moment that a bank entered during the sample period as a *de novo* bank with a majority foreign ownership share.	Claeys and Hainz (2005).
d) Foreign bank share (%)	The ratio of foreign loans to a country's total volume of loans. This variable measures the competition effect following foreign bank entry.	Fitch/IBCA/BvD/Bankscope.
3. Bank-specific control variables.		
a) Liquidity (%)	The ratio of liquid to total assets. Liquid assets comprise cash and bank deposits, including central bank deposits. High cash holdings represent an opportunity cost of holding higher-yielding assets (e.g. loans) that can increase lending rates.	Fitch/IBCA/BvD/Bankscope.
b) Costs (%)	The ratio of total expenses to average assets. Higher costs will lead banks to charge higher lending rates.	Fitch/IBCA/BvD/Bankscope.
c) Market share (%)	The share of loans to a country's total bank loans. Market share intends to capture market power. More market power can result in higher lending rates.	Fitch/IBCA/BvD/Bankscope.
d) Δ Loan loss reserves	The log difference in loan loss reserves with respect to the previous year is intended as a proxy for credit risk. A rise in credit risk will lead banks to increase their lending rates.	Fitch/IBCA/BvD/Bankscope.

e) Capital (%)	The capital-to-assets ratio. Banks need to hold regulatory capital as a buffer against credit risk; however, large capital holdings are costly for banks. A high capital ratio may consequently lead to high lending rates.	Fitch/IBCA/BvD/Bankscope.
4. Country-specific control variables.		
a) Top 3 bank share (%)	This variable captures the concentration in the loan market.	Fitch/IBCA/BvD/Bankscope.
b) Total number of banks	A country's total number of banks. This variable is included to control for the increase in the number of banks following a *de novo* entry.	EBRD Transition reports.
c) Credit registry	A dummy variable that equals one from the year of the incorporation of a credit registry onward, zero otherwise. The incorporation of a credit registry induces a downward shift in the overall degree of information asymmetry in the banking market, which is expected to lead to lower lending rates.	Djankov, McLiesh and Shleifer (2005).
d) Inflation (%)	Changes in inflation will be paralleled by changes in the nominal lending rate.	EBRD Transition reports.
e) GDP growth (%)	The real growth in GDP captures the business cycle and represents another loan demand factor.	EBRD Transition reports.
f) Real short term interest rate (%)	The real short term interest rate defines a lower bound for bank funding and represents another cost.	
f) EBRD enterprise reform index	Index based on the amount of budgetary subsidies, the efficiency of tax collection for social security, the share of industry in total employment and the change in labor productivity in industry (between 1 and 4).	EBRD Transition reports.
5. Instruments.		
a) Creditor rights index	An index aggregating creditor rights, taken from Djankov et al. (2005). The index ranges from 0 (weak creditor rights) to 4 (strong creditor rights).	Djankov, McLiesh and Shleifer (2005).
b) Factors of Economic Freedom	Factors related to: Trade Policy; Fiscal Burden of Government; Government Intervention in Economy; Monetary Policy; Capital Flows and Foreign Investment; Banking and Finance; Wages and Prices; Property Rights; Regulation; Informal Market Activity. Each factor ranges from 1 (free) to 5 (repressed).	Heritage Foundation.
c) Takeover target	The relative number of potential (domestic) takeover targets to the total number of banks in a country.	Fitch/IBCA/BvD/Bankscope.

Table 5.3: Descriptive statistics (808 observations).

Variable	Mean
Lending rate	17.62
Foreign bank	0.15
Foreign MA	0.2
(Foreign MA)*(Age)	3.34
(Foreign MA)*(Age2)	14.64
Foreign Greenfield	0.05
(Foreign Greenfield)*(Age)	5.59
(Foreign Greenfield)*(Age2)	34.18
Foreign bank share	40.8
Bank share of Foreign MA	27.91
Bank share of Foreign Greenfield	4.86
Liquidity	27.44
Δ Loan loss reserves	45.79
Costs	10.4
Market share	7.18
Capital	11.98
Credit Registry	0.56
Top 3 bank share	59.39
Total number of banks	37.44
Inflation	6.17
GDP growth	3.98
Real interest rate	4.15
Enterprise reform index	2.83

Note: Countries included are Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia. Detailed information on variable construction is provided in Table 5.2.

Table 5.4: The impact of the mode of entry on bank lending rates.

	I	**II**	**II**	**IV**	**V**	**VI**
Dependent variable	Lending rate					
	OLS Regressions			IV Regressions		
Foreign bank	-2.48***	-2.53***	-2.57***	-2.36***	-2.55***	-2.52***
	[0.81]	[0.82]	[0.81]	[0.80]	[0.81]	[0.82]
Foreign MA	-0.34	0.74	-0.19	-0.16	0.43	0.09
	[0.64]	[0.84]	[0.98]	[0.58]	[0.72]	[0.87]
(Foreign MA)*(Age)		-0.35**	0.28		-0.29*	0.15
		[0.17]	[0.52]		[0.17]	[0.56]
(Foreign MA)*(Age2)			-0.08			-0.07
			[0.06]			[0.07]
Foreign Greenfield	-0.91	2.66	-7.8	-0.32	1.12	0.31
	[0.93]	[2.40]	[4.89]	[0.84]	[0.80]	[0.95]
(Foreign Greenfield)*(Age)		-0.65*	3.41*		-0.34**	0.51
		[0.34]	[1.80]		[0.14]	[0.66]
(Foreign Greenfield)*(Age2)			-0.36**			-0.11
			[0.16]			[0.08]
Foreign bank share	-0.06**	-0.06**	-0.06**	-0.07***	-0.07***	-0.07***
	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]
Liquidity	0.15***	0.15***	0.15***	0.16***	0.15***	0.15***
	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]
Δ Loan loss reserves	0	0	0	0	0	0
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]

(Continued)

Costs	0.25***	0.24***	0.24***	0.25***	0.25***	0.25***
	[0.08]	[0.08]	[0.08]	[0.08]	[0.08]	[0.08]
Market share	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]
Capital	0.01	0	0	0.01	0	0
	[0.03]	[0.03]	[0.03]	[0.03]	[0.03]	[0.03]
Credit Registry	-7.98***	-7.94***	-7.99***	-4.52*	-4.33*	-4.43*
	[2.91]	[2.92]	[2.93]	[2.60]	[2.59]	[2.59]
Top 3 bank share	0.16**	0.17**	0.16**	0.22***	0.22***	0.22***
	[0.08]	[0.08]	[0.08]	[0.08]	[0.08]	[0.08]
Total number of banks	0.24***	0.25***	0.24***	0.28***	0.29***	0.29***
	[0.07]	[0.07]	[0.07]	[0.07]	[0.07]	[0.07]
Inflation	-0.19	-0.2	-0.2	-0.23	-0.23	-0.23
	[0.14]	[0.14]	[0.14]	[0.14]	[0.14]	[0.14]
GDP growth	-0.23	-0.23	-0.24	-0.14	-0.14	-0.15
	[0.43]	[0.42]	[0.42]	[0.37]	[0.37]	[0.37]
Real interest rate	-0.3	-0.31	-0.31	-0.45	-0.46	-0.46
	[0.33]	[0.33]	[0.33]	[0.28]	[0.28]	[0.28]
Index of enterprise reform	8.14**	8.13**	8.21**	7.39**	7.22**	7.29**
	[3.86]	[3.86]	[3.86]	[3.27]	[3.26]	[3.25]
Constant	-17.76	-17.93	-17.88	-21.61**	-21.25**	-21.39**
	[11.61]	[11.57]	[11.58]	[10.60]	[10.58]	[10.56]
Country*Year Dummies	yes	yes	yes	yes	yes	yes
Observations	808	808	808	808	808	808
R-squared	0.55	0.55	0.55	0.54	0.55	0.55
N banks	206	206	206	206	206	206

Note: Coefficient estimates are based on ordinary least squares or instrumental variable regressions. Standard errors are robust and clustered on banks. Variable definitions are provided in Table 5.2. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 5.5: Competition effect depending on the mode of entry.

	II	**II**	**III**	**IV**
Dependent variable	Lending rate			
	OLS Regressions		IV Regressions	
	Domestic	Foreign	Domestic	Foreign
Foreign bank		-1.74		-1.04
		[1.12]		[1.80]
Foreign MA		0		0.95
		[0.00]		[1.74]
(Foreign MA)*(Age)		-0.16		-0.19
		[0.18]		[0.18]
Foreign Greenfield		0.83		0.52
		[2.60]		[0.79]
(Foreign Greenfield)*(Age)		-0.34		-0.14
		[0.40]		[0.29]
Bank share of Foreign MA	-0.08***	-0.08***	-0.10***	-0.02
	[0.03]	[0.01]	[0.03]	[0.02]
Bank share of Foreign Greenfield	-0.28***	-0.14*	-0.19**	-0.13
	[0.08]	[0.08]	[0.09]	[0.10]
Liquidity	0.12***	0.18***	0.12***	0.18***
	[0.02]	[0.04]	[0.02]	[0.04]
D Loan loss reserves	0	0	0	0
	[0.00]	[0.00]	[0.00]	[0.00]

(Continued)

Costs	0.15*	0.69***	0.15*	0.69***
	[0.08]	[0.12]	[0.08]	[0.12]
Market share	-0.03	0.05**	-0.03	0.05**
	[0.03]	[0.02]	[0.03]	[0.02]
Capital	-0.01	0.11**	-0.01	0.11**
	[0.04]	[0.05]	[0.04]	[0.05]
Credit Registry	-0.26	2.82***	0.05	4.36***
	[2.62]	[1.05]	[2.65]	[1.01]
Top 3 bank share	0.06***	0.05	0.06***	-0.06
	[0.02]	[0.04]	[0.02]	[0.05]
Total number of banks	0.01	0.11***	0.02	0.01
	[0.08]	[0.03]	[0.09]	[0.04]
Inflation	0.1	-0.18*	0.09	0.28***
	[0.06]	[0.10]	[0.06]	[0.07]
GDP growth	0.99***	-0.23	0.90***	-0.95***
	[0.27]	[0.15]	[0.26]	[0.25]
Real interest rate	0.18	0.03	0.18	0.27**
	[0.15]	[0.09]	[0.15]	[0.11]
Index of enterprise reform	-2.64*	0	-2.23	10.16***
	[1.55]	[0.00]	[1.56]	[1.81]
Constant	15.03*	0.89	14.39*	-22.26***
	[8.34]	[4.05]	[8.60]	[6.34]
Country*Year Dummies	yes	yes	yes	yes
Observations	480	328	480	328
R-squared	0.51	0.73	0.51	0.73
N banks	139	97	139	97

Note: Coefficient estimates are based on ordinary least squares or instrumental variable regressions. Standard errors are robust and clustered on banks. Variable definitions are provided in Table 5.2. * significant at 10%; ** significant at 5%; *** significant at 1%.